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BIRD-BANDING

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BIRD-BANDING

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BLUE JAYS AT NASHVILLE, TENNESSEE MOVEMENTS, NESTING, AGE

By Amelia R. Laskey

One thousand Blue Jays *(Cyanocitta cristata)*, banded in twenty-five years (1932-1957) at my home and substations within a five-mile area at Nashville, Tennessee, have yielded considerable data on the movements, nesting and longevity of this species.

The most remarkable life history among these birds is that of the O'Jay family. O'Jay, who proved by later behavior to be a male, was banded (No. 40-319299) on January 23, 1943, at a substation operated by Jim Metcalf at his home about three-quarters of a mile southeast of my home and was trapped at my home station on June 6, 1946. On that date he was marked for sight identification with an orange-colored band and thus became O'Jay. He remained as a permanent resident at my home until his last appearance on September 18, 1950, when at least 8⅓ years old.

In 1947 his brood of 4 young hatched on May 3 and all were still here until July. In 1948, he and his mate began building on March 19 in an ivy-covered fork of a hackberry tree close to our windows. Eggs were laid April 3-7 while a Tufted Titmouse *(Parus bicolor)* (Laskey, 1957) and a Robin *(Turdus migratorius)* were also laying eggs in their nests; the titmouse had 7 eggs in a box on a tree a few feet west, the Robin had 4 eggs in her nest on a hackberry limb some 20 feet east. All of these nests were entirely successful, the Robin fledging 4 young on May 1, the titmouse 7 young on May 9 and the Blue Jay 5 young on May 11. There were no conflicts noted between the families. The main items of food brought by the O'Jays to the nestlings were the pupae of the tent caterpillar *(Malacosoma americana)*. These were extracted from the cocoons at some distance from the nest and several carried inside the mouth at one time to the young. In April and May, one pair of Blue Jays can destroy hundreds of the cocoons, thus eliminating potential thousands of eggs due to hatch on fruit trees the following spring (Laskey, 1954). F. E. L. Beal mentions Blue Jays as destroyers of tent caterpillar eggs in winter (1915 and 1926:19).

Although the 5 fledglings had started to pick up food for themselves in early June, they continued begging from their parents and were fed bread as late as August 18, 1948, when about 4 months old.

In March 1949, O'Jay and his mate built a nest in the west section of the banding station about 100 feet from the 1948 nest site, but abandoned it to start another on March 30 in the same tree that they had used for the 1948 brood of 5 young.

In 1949, *three* of this 1948 brood of the O'Jays returned to the banding station, a remarkable and unusual ratio of returns from one brood. One of them, a color-banded female named "Blink," mated with an aluminum-banded bird and *used the nest* that her parents had built and abandoned in March. She laid 5 eggs (April 27-May 1) which hatched May 16 and 17. The 4 surviving young left the nest on June 6. They disappeared later that summer, but one of them, R. G., grandson of O'Jay, returned in 1950, left in September, returning in April 1951 for that summer.

Blink did not migrate for her second winter (1949) and was seen feeding amicably with her parents, the O'Jays.

In 1950, she disappeared in September, returning in April 1951 to remain until October 7. She returned in April 1952 and was trapped a few days later, soiled with the clay she was molding into her nest cup. She was not seen after June when she was 4 years old. Blink provided a number of pertinent observations: she was the only bird in my experience that used a nest built by her parents; she nested at one year of age and laid a full complement of 5 eggs, although she nested later in the season than her mother.

After abandoning their unused nest in 1949, the O'Jay pair quickly built a new one near our house. By early April, the female was incubating a set of 4 eggs which produced a single fledgling that left the nest on May 10 and was still here in August. One egg had disappeared during incubation and 2 addled eggs remained. The O'Jays built another nest 30 feet up on a horizontal limb of a nearby hackberry tree. On June 20 when a boy climbed to the nest for me, a single nestling dropped to the ground while the parents were flying about, excitedly, giving alarm calls. It left a day or two prematurely. One addled egg remained in the nest. I hand-raised the nestling, releasing it on July 16 when it had learned to pick up food, but have no further data on its survival. The O'Jays, being deprived of their nestling, proceeded with a third nesting for 1949 (not located). On August 10, they were feeding two short-tailed fledglings. Both of these young birds left the station in September and *both returned in 1950.* One of them returned in 1951, 1952, 1953 and was trapped on June 8, 1956, minus the color-bands (age 7 years). Although the O'Jays had three nests in 1949, they raised only three young to independence in comparison to five young for the one nest of 1948.

In 1950, two young left the nest on May 13; one was trapped last on June 12 and the other on July 2. Apparently they raised no others that year. For the 4 nesting seasons, they had 15 young from 6 nests, averaging 2.5 per nest and 3.7 per season.

Although O'Jay had the same mate for at least the latter three years of his life, she was unusually wary of traps and was not banded. She came within a few feet of me when food was offered, and could be found daily, winter and summer, associating with O'Jay. Old Blue Jays and those that remain for winter are particularly difficult to trap here although they come freely to feeders. Color-banding is necessary to obtain data on such individuals; in 1957-58, a wintering pair, wearing old aluminum bands, have apparently lost their colors and have eluded the traps and my efforts to obtain their records.

NEST DATA

Over a period of 9 years, I obtained comparable data on 10 nests, 7 with 5 eggs each, 3 with 4 eggs each (two were first clutches and one a replacement set). From 47 eggs, 26 young fledged (55 per cent), an average of 2.6 young per nest. Two of the sets of 5 eggs disappeared from the nest during incubation.

Nest-building starts in March here, but the peak occurs in April. My earliest record is a clutch of 5 being incubated April 4, 1946, at my home.

Bent (1946:37) states that the northern Blue Jay ordinarily lays 4 or 5 eggs, sometimes 3, frequently 6 and very rarely 7 eggs. From a search of the literature, it seems that 6 egg sets are not common, and that 7 egg sets are very rare. I was unable to find any cited record of a 7 egg set.

A 6 egg set is cited for Connecticut, Illinois, Michigan and Oklahoma by Sage and Bishop (1913), Ford et al (1934), Wood (1951), and Nice (1931) in their respective State books. Strong (1919) cites a set for New York and for Rhode Island. Stone (1937) cites one clutch of 6 eggs and a brood of 6 young for New Jersey.

Feeding of the female by her mate usually begins in March here, continuing through nest-building, egg-laying and incubation. O'Jay ceased with the hatching of the eggs when he assumed the greater part of food-gathering for the young while his mate brooded. Incubation and brooding were by the female. While incubating, she was sometimes fed on the nest, but more often, she left the nest to meet her mate in a tree 15 or more feet from the nest to receive the food. She assumed the begging posture of a juvenile. During watches totaling 27.9 hours during incubation, O'Jay fed his mate 54 times (1.9 feedings per hour).

In 21 complete attentive periods during incubation, the average time that O'Jay's mate spent on the nest was 42.8 minutes, ranging from 10 to 76 minutes; inattentive periods averaged 7.9 minutes for 29 complete periods, ranging from one to 32 minutes.

In three nests where incubation and hatching dates are known, all eggs hatched in 16½ to 17 days after the laying of the last egg of the set. In O'Jay's nest, the 5 young left at 18 days of age; in Blink's nest, 4 young left when 19 to 19½ days of age (one died previously); a brood of 3 left at 19.5 to 20 days. Young begin some foraging about three weeks later, but may follow parents and be fed occasionally for one or two months longer.

J. R. Arnold (Bent 1946:38) found the incubation period to be 17 days in New Jersey, 17 to 18 days in New York and the nestling period to be 17 to 21 days.

On June 13, 1948, when O'Jay's young were about 51 days old, he hulled a sunflower seed on a brick walk near two of his begging young, then carried the seed inside of his mouth to feed a third youngster in a nearby tree. One of those on the walk attempted to hull a seed. It knew how to hold the seed under its toes at the edge of a brick and to pound with its bill, but it was an awkward and unsuccessful procedure. First it toppled off the walk, landing on its head, then the seed slipped

repeatedly from its toehold. On the following day, the mother gave one of the brood an unhulled sunflower seed which it was able to peck open, consuming the contents in tiny bites. Yet these same youngsters still begged from their parents in August and were occasionally fed. Marshall in Arkansas (1949:189) reports banding a brood of 5 young which came with their parents to his feeder in December, 1948. They were fed from December 2, when he first saw them, to December 17. After that date the young fed themselves and continued coming through February, 1949. Bent (1946:38-39) cites Francis Zirrer's observation of Blue Jays in winter tearing dead mice which he had placed on a feeding shelf and feeding portions to young birds.

SUN-BATHING AND ANTING

In May and June, I have seen Blue Jays sun-bathing as they squatted on the lawn with horizontally-spread wings and head tilted sidewise. This behavior occurs on sunny, humid days. On May 25, 1954, three Blue Jays sprawled in a sunny spot on our lawn about 4 feet apart, undisturbed at my watching them. Bent (1946:45) describes sun-bathing by Blue Jays.

On August 30, 1948, three aluminum-banded Blue Jays arrived at the brick walk feeding location which contained no food at the time. As two of them stood quietly, one was very active, hopping on and off the walk, picking up some tiny object, assuming the awkward "anting" position of standing on its tail, running its bill along the inner surface of its primaries. Quickly resuming the normal position, it would hop to another spot to repeat the performance. After three or four anting manoeuvres, it picked up a dry leaf and rubbed it on the primaries before flying. Examination of the spot revealed at least two species of ants moving about (Laskey 1949). In 1908, an account of "anting" by a Blue Jay was published by Grace Elliott, but she interpreted the act as storing food under the wings (Bent, 1946:41). Whitaker has compiled an excellent résumé of published material on anting by many species of birds, including the Blue Jay, using ants and also many substitute materials (1957).

SONG

At an early age, immature Blue Jays sing a pretty, lengthy, formless song. On July 5, 1953 in mid-afternoon, I heard a very soft song (whisper type) close at hand, but at first could not see the bird. Searching for the singer, I though it might be a Catbird *(Dumatella carolinensis)* or an immature Mockingbird *(Mimus polyglottos)* or possibly a Starling *(Sturnus vulgaris)*. The song was a beautiful, uninterrupted flow of very soft melodious notes. Then I saw the songster, a Blue Jay, exact age unknown, singing with closed bill. Only a movement of the throat feathers indicated the source of the song.

On April 20, 1952 a Blue Jay song sounded like that of a Blue-gray Gnatcatcher *(Polioptila caerulea)*. Bent (1946:47) and Goodhue (1919) mention several instances of Blue Jay song.

FOOD-BURYING HABIT

A common habit of wintering Blue Jays is the carrying away of food from a feeding shelf to bury it in the ground or snow. At my station, bread and sunflower seeds are favored for storing. A pair will work steadily to exhaust a large supply, picking up 12 to 15 sunflower seeds, flying off with the mouthful to peck a hole in the ground, deposit several in one spot, carefully covering them with dead leaves. Watching the bird collect seeds for storing, one is given the impression that the bird is swallowing the unhulled seeds. Some of the cache is found later and eaten. I have seen Blue Jays search diligently in a place they had buried food some weeks previously. That many seeds are not found is quite evident in spring when groups of sunflower seedlings sprout on the lawn and in flower plantings. If the bird is collecting seeds for immediate consumption, it will fly to a tree branch, a rock or an exposed tree root to hammer off the hull with the bill as the seed is held under the toes. Sometimes a quantity of hulls will accumulate about a favorite "pounding" spot (Laskey 1942, 1943). Alexander Wilson (1808:17) quotes Bartram: "The Jay is one of the most useful agents in the economy of nature for disseminating forest trees. . . . These birds alone are capable in a few years time to replant all the cleared lands."

MIGRATION

Trapping records of Blue Jays wearing numbered bands, sight records of color-banded individuals and field observations during 25 years indicate that a few are permanent residents for at least a part of their lives, but most of the population migrate in September and return in late March and April. At my home, two to four of the older birds may remain for winter and for nesting.

Five of my banded birds have been reported by Fish and Wildlife Service as recoveries from other states, indicating a southward movement from Nashville to their wintering areas. Three birds banded in May, June and August were killed at Florence, Alabama, in September, January and February, respectively. Two, banded in August, were killed in Mississippi, one at Marietta in November and one at Starkville in December. These indicate flights of approximately 100 to 250 miles in a southwesterly direction. On January 6, 1954, Katherine A. Goodpasture reported a transient flock of 34 Blue Jays in farm country about 15 miles southwest of Nashville where regular observations were being made (personal communication). Sue M. Bell reported a Blue Jay flight on September 29, 1957, in the forenoon, after 9:00 a.m. when flocks of 63, 11, 36, 4, 3 were counted in White County, about 80 miles east (slightly south) of Nashville (personal communication).

At this time (end of December, 1957), there are 957 of the one thousand banded Blue Jays that could have lived one or more years since they were banded. This figure represents the number banded to the end of 1956 (965), minus the 8 banded individuals that were shot or found dead within the first year.

As Blue Jays receive no protection under Federal or State laws, many are shot as living targets. This practice is justified by the assumption that all Blue Jays are habitually destructive to other birds. I have not found this to be true. In 30 years of intensive bird-watching, I have

one observation of circumstantial evidence that a Blue Jay attempted to take nestling Cardinals *(Richmondena cardinalis)* and one instance of a Blue Jay pair usurping a nest being built by Robins. Todd (1940:380) says that the Blue Jay's depredations at nests of other birds have been greatly advertised—perhaps unduly so, and that three-fourths of its food is of vegetal matter and one-fourth almost entirely of insects and small mammals. He also states (1940:382) that one's impression of the Blue Jay may be the result of resentment engendered by an introduction to it in Audubon's portrayal of Blue Jays in the act of breaking and devouring eggs of other species. F. E. L. Beal (Bent, 1946: 40) states that examination of nearly 300 stomachs do not bear out the reports of the nest-robbing proclivities of the Blue Jay.

From records of my banded Blue Jays, I find evidence of a strong attachment to their home area during the breeding season and that 198 birds (20.7 percent of the 957 birds above mentioned) survived from one to 9 years. Of these 27 were recovered when shot or found dead in Nashville, 3 were shot in other states, one was killed in a rat trap, two were paralyzed from poison spray in Nashville and died. The remainder, 165 birds, were re-trapped alive at the banding stations.

Surviving for at least one year were 54 birds; 2 years, 70 birds; 3 years, 23 birds; 4 years, 22 birds; 5 years, 11 birds; 6 years, 5 birds; 7 years, 5 birds; 8 years, 4 birds; 9 years, 4 birds.

Among these, 58 birds had been banded as nestlings. Eight of them (13.8 percent) were found near the place of banding from one to 7 years later. All but one of these nestlings had been banded about my home where systematic trapping was practiced. Most of them were of the O'Jay family. One of them, female Blink, migrated for her first winter, remained with her parents for the second winter and again migrated for the following winter.

Of the 198 birds that survived from one to 9, plus, years, 73 were aged as adults at the time of banding, 70 as first-year birds (sometimes called immature, juvenile or juvenal), 8 as nestlings and 47 were unaged. In my early years of banding, I was not experienced enough to age some summer and early autumn birds. It is still difficult to be sure of age in September after the molt of the juvenal plumage is completed. Earlier in the season the texture of the plumage shows immaturity, particularly in the underparts, which in the juvenal is fuzzy in appearance. The color of the inside of the bill, changing from largely whitish in the first summer to all black by the next spring, is characteristic (Nichols, 1955; Bergstrom, 1958).

O. M. Bryens, Luce County, Michigan (1949) banded 433 Blue Jays in about 25 years. Most of these were trapped in winter when natural food became scarce. Of these, 31 birds (7.2 percent) were retaken in later years, the oldest in its 9th winter, but few after their 4th winter. This drop in numbers after the 4th year corresponds with my tabulations. However, it must be remembered that the older birds become very wary and are much more difficult to trap than the less experienced youngsters.

In January, 1943, Bryens trapped 2 birds from a brood of 4, banded in the nest June 22, 1941, indicating that they had spent the second winter at the hatching place as had the female, called Blink, at my home.

Among the published records of old banded Blue Jays are individuals that reached 10, 11, 13, and 15 years of age (Bent, 1946:45); one in Cohasset, Massachusetts, banded October 10, 1932, retaken March 16, 1944, when about 12 years old (Harding, 1944); one in Wisconsin, banded May 14, 1930, recovered within a mile of the place of banding on February 16, 1943 (Bunting, 1944); another banded at Long Island, New York, on May 11, 1939, was retaken and released at Laurel, Maryland, on January 16, 1948, and March 4, 1952 (Beals, 1952). The latter two birds would be almost 14 years old.

Hickey (1952:119) states: "Although *Cyanocitta cristata* is one of the commonest breeding birds in eastern North America, no statistics have been published on the mean number of eggs or the mean number of young." In his summary, based on records of banded birds in the Fish and Wildlife Service files, he states "the mean adult mortality rate was computed as 45 percent per year, but band loss perhaps distorted this result slightly." The oldest Blue Jay in his study died in its tenth year of life.

SUMMARY

Between 1932 and 1957, 1,000 Blue Jays were banded at my stations in Nashville, Tennessee.

A male, known to have lived 8 1/3 years had the same mate for at least three years, the pair being permanent residents during this period. Three of their 1948 young and two of their 1949 young returned in later years, as well as a grandson of 1949.

Clutches consisted of 5 and 4 eggs; incubation and brooding were by the female. Courtship feeding of the female by her mate started in March, and continued until the hatching of the eggs when the male assumed the greater share of food-gathering for the nestlings. Incubation period in 3 nests was 16½ to 17 days; nestling period 18 to 20 days.

At one nest, the average attentive period was 42.8 minutes, ranging from 10 to 76 minutes; periods off the nest averaged 7.9 minutes, ranging from one to 32 minutes. During watches totaling 27.9 hours, the male fed his mate 54 times, 1.9 feedings per hour.

The main items of food brought to their brood of 5 nestlings were pupae of tent caterpillars, thus eliminating potential thousands of larvae that would have fed on fruit trees the following spring.

From 47 eggs in 10 nests, 26 young fledged (55 percent).

Sun-bathing, anting, singing and food-burying were noted.

Most of the summer residents left in September and returned in late March and April.

Five birds were found in winter season from 100 to 250 miles southwest of Nashville.

A few birds remain as permanent residents. One bird, a female, banded as a nestling, changed her status, migrating for her first winter, remaining with her parents for the second winter and again migrating for the third winter.

Of 959 birds banded (1932-1956) that could have lived at least one year at this time, 198 (20.7 percent) survived from one to 9 years. Fifty-eight of these had been banded as nestlings: 8 of them (13.8 per cent) were found near the place of banding from one to 7 years.

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SOME REPEAT DATA ON THE CARDINAL

BY HOWARD YOUNG

The establishment of a banding station in a previously untrapped area doubtless produces various changes in the behavior of the exposed population. As a persistent source of food it may alter the movement patterns of some individuals, and as a location where there is a frequent concentration of birds it may attract predators and thus modify the local mortality rate. Capture in a trap produces differing reactions among the victims, which will affect the probability of their being recaptured.

Where banding data are used to gain information about local movements, survival, etc., attempts should be made to determine the effects of such factors. The following material is an effort in this direction, concerned particularly with the trap-reactions of individuals after initial capture.

During the period Jan. 4, 1953 to May 24, 1953, a total of 88 cardinals (35 males, 53 females) was captured at Fayetteville, Arkansas. The traps were single-cell potters, and scratch feed was used as bait. In this period of time (141 days), traps were set on 133 days. There was a constant total of 15 traps, each permanently located at its own spot within the approximately one-half acre trapping area. This resulted in 225 captures of cardinals, the original 88 captures, and 137 repeats (1,995 trap-days).

Prior to the time of this study, trapping had been carried on in the same area; but a varying number of traps, shiftings of locations, and irregular trapping periods prevented the accumulation of useful data. Eighty cardinals (33 males, 47 females) had been captured during this period of intermittent banding.

Of the 88 birds included in the following discussion, 34 (16 males, 18 females) are birds which had been banded during the period last described, and prior to Jan. 4, 1953. Their date of banding varied from 20 to 66 days before the beginning of the study, with an average of 38 days. Since these birds constituted nearly 40% of the sample available for the present work, it was desirable to include them, providing their repeating history did not vary significantly from those first caught after the project had been organized.

To consider this problem, the birds were divided into two groups: A (banded prior to Jan. 4, 1953), and B (banded on or after Jan. 4, 1953). Statistical tests indicated that the groups did not vary significantly in any of the following respects: sex ratio, no. males repeating, total no. male repeats, total no. female repeats, days elapsing to first recapture (either sex). In comparing the number of females repeating, a X^2 value of 4.750 was obtained, which exceeds the level of probability at 5%, comparatively more females repeating in the A group than in the B group. Since the tests on all other characteristics indicated that variations such as were found would be frequently expected from chance alone, and since some variations exceeding the 5% X^2 level can of course also be ascribed to chance, it was felt that pooling of the two sets of data was permissible.

Consequently these 34 cardinals banded prior to Jan. 4, 1953 were included; their first trapping after Jan. 4th was considered as the original capture for use in this analysis, and all subsequent captures were considered as repeats.

One purpose of the study was to observe the variation, if any, in trap response (trap addiction vs trap aversion) among the individual cardinals. Since the species shows a marked sexual dimorphism, it was also possible to note and measure any difference in trap reaction between the sexes. It may be stated at this point that much confidence was placed in the sedentary habits of the cardinal, the problem of length of stay being lessened by choosing a non-migratory species as a subject of study.

There were no other banding stations within 50 miles, and there were no foreign recoveries; all repeats referring to recapture at the home station. Previous to the establishment of this station, 49 cardinals had been banded the preceding spring about 1 mile distant. Two of these birds appeared at the new station, one male and one female. As in all banding studies, the error introduced by movement, and whether it is equally distributed between the sexes, is an unknown factor.

In this study a bird was considered as present only until its last capture. This perhaps introduces an error, since some birds present will probably refuse to re-enter the traps. At the same time we eliminate those birds which have permanently moved from the area.

Data bearing on the points above are presented in Table 1. The sex ratio at the time of first capture does not vary significantly from 100:100 as tested by X^2, and the proportion of birds repeating is almost exactly even between the sexes. However, in the total number of recaptures (which reflects the frequency with which individuals repeated) a marked difference between the sexes appears. The recaptured males repeated at about 175% the frequency of recaptured females, and this apparently reflects a real difference between the group ($P<1\%$). Since the birds were recaptured at various times in the study, those first captured early in the program had more opportunity to repeat than those captured later. With this point in mind, the average number of trap days that the repeating males and females were known to be exposed to was computed, to see if this explained the difference.

When this analysis was made, it was found that the average known exposure was the same for each sex—34 days. The discrepancy in repeats is thus expressed more accurately in Table 1 under the column entitled "Ave. No. Recaps./Day." However, one male repeated 25 times

TABLE 1—CARDINAL BANDING DATA

	Captured		Recaptured		Total Recaptures		Ave. No.* Recaps.	Ave. Recaps. Per Day	Ave. No. Days to 1st Recap.
	No.	%	No.	%	No.	%			
Males	35	40	16	46	77	57	4.8	.14	8.6
Females	53	60	23	43	60	43	2.6	.08	14.7
Totals and Averages	88	100	39	44	137	100	3.5	.11	12.2

*Omits non-recaptured birds.

during a known exposure of 92 days; this may possibly reflect a "position effect" of a bird rather permanently settled in the immediate vicinity, which would tend to be caught more frequently than those visiting the area at irregular intervals. When the data are recomputed, with this male omitted, the variation between the two sexes is of a degree that could well be ascribed to chance ($5\% < P < 10\%$).

Hundley (1953) reported on two trapping periods for the cardinal. From November 5, 1950 to April 20, 1951, 44% of 52 males repeated, while 56% of 48 females repeated. From October 17, 1951 to February 14, 1952, 56% of 75 males repeated, while 55% of 77 females repeated. Neither difference is significant.

The possibility of differential trap vulnerability may also be examined by considering the days elapsing before the first recapture, on the logical assumption that a bird which had acquired a wariness towards traps would take longer to repeat than one not so conditioned. Despite the fact that females on an average waited six days longer than males before re-entering traps, the difference does not appear to be significant. ($t = 1.142$, $P > 30\%$).

In monogamous species an approximately 100:100 sex ratio is usually assumed. The small sample in the present report does not vary significantly from this ratio. Also Hundley (op. cit.) in two larger samples found 52% males in 100 birds trapped ('50-'51) and 49% males in 152 birds trapped ('51-'52). Variation here from 100:100 is obviously insignificant.

With the possible exception of the frequency of repeating, a sex difference in behavior towards traps is not demonstrable in this species with the data available. Unless one hypothesizes a sexual variation in the initial contact with traps it would appear that the sex ratios of the cited samples accurately reflected those of the cardinal populations in the areas.

The use of banding data to compute population levels, length of stay, etc., is dependent upon the assumption (among others) that the banded birds are all equally susceptible to retrapping. Such was not the case in the studies of Borror (1948) and Hundley (op. cit.). Though the problem is seldom mentioned in bird-banding literature, it has been considered in other vertebrate studies, and many banders have had

TABLE 2

Distribution of first repeats compared with that expected from a p value of .11.

p	day	exp.	obs.
.110	0	3.08	2
.098	1	2.74	0
.087	2	2.44	3
.078	3	2.18	1
.069	4	1.93	2
.061	5	1.71	2
.055	6	1.54	0
.049	7	1.33	2
.043	8	1.20	0
.039	9	1.09	1
.034	10	.95	0

experience with "trap-happy" individuals, while others are identifiable in the area, but repeat only at rare intervals, or not at all.

As mentioned before, we may measure this "retrappability" of individuals by observing the number of days elapsing before a bird is recaptured for the first time. Here we make use of the data to determine p, the probability of a bird being recaptured on any given day. This is computed by use of the formula: $p = n/t$, where n equals the number of days on which a bird repeats, and t equals the time (no. days) exposed to traps. The upper limit of p obviously is 1.0. In the case of the present data, a p value of .14 is obtained for the males, of .08 for the females. Computed for the entire group, the weighted average is .11. The same formula could be computed using n to represent the total number of repeats (including multiple repeats on a single day). In the present case the change in the value of p would be a negligible increase. See Young, Neess and Emlen (1952) for further consideration of this expression.

Since p represents the probability of being recaptured on any day following banding, then 1-p equals the probability of escaping traps on any given day. It follows that $p\ (1\text{-}p)$ is the probability of escaping traps the first day but repeating on the second. Similarly $p\ (1\text{-}p)^2$ represents the chance of a bird first repeating on the third day, and $p\ (1\text{-}p)^{n-1}$ of a bird first repeating on the nth day.

Twenty-eight cardinals (10 males, 18 females) had repeat records indicating that they had exposures of 10 days or more to the traps. Table 2 shows the distribution of first repeats during the first ten days which actually occurred in this group, compared with that expected from the stated p value.

It is clear that the two have little similarity. A p value of .11 should result in the first recapture of 20 birds within the first ten days after banding, while actually only 13 repeated. One of these cardinals did not repeat until 55 days after the initial capture. Although the sample is not large for statistical purposes, a X^2 test (using small sample adjustments) on the total of 28 birds indicates a non-chance variation from the expected ratio. Retrapping therefore does not seem to have been random, and the distribution of the repeats suggests that trap-shyness was a major factor operating. Actually of the entire cohort (88 birds), 56% never repeated, although trapping continued for an average of 94 days after their original capture.

TABLE 3—TRAP SUCCESS

Period	Success*
Jan. 4 - Jan. 29	.21
Jan. 30 - Feb. 24	.13
Feb. 25 - Mar. 23	.09
Mar. 24 - Apr. 23	.11
Apr. 27 - May 24	.02

*no. captures/no. trap days

Banding activities tend to produce both trap-shy and trap-addicted individuals, but it is not safe to assume with Borror (1948) that the two reactions cancel each other out. While these responses produce compensating errors, numerically they are not necessarily equal, and the intensity of the individual reactions is variable.

Further trouble arises when the trapping period extends over any considerable period of time, since trap-success varies with changing weather and seasonal changes in the bird's activities. Table 3 summarizes such data for this study.

Comparable problems exist in retrapping programs for small mammals (Young, Neess, Emlen, op. cit.). Banding studies on such topics as populations, stay-over period, survival, etc., will be strengthened if records are reported in such a way that efforts can be made to evaluate these difficulties. With large samples it might be possible to measure the variations in trap-reaction with enough precision that appropriate mathematical adjustments could be made where necessary.

To accumulate data of this type, several features seem mandatory in the banding program:

1) Number and type of traps should be fixed
2) Position of traps should be fixed
3) Bait should not be varied
4) Records should be kept of trap-days
5) All repeats should be recorded

Change in any of these features results in unmeasurable variations in the probability of retrapping, or leaves gaps in the needed data.

SUMMARY

1) Trapping activities in Arkansas from Jan. 4, 1953, to May 24, 1953, resulted in 225 captures of 88 cardinals.

2) The sex ratio of the trapped sample did not vary significantly from 100:100, and the trap-reactions of the sexes were similar.

3) Analysis of the recapture data indicates that the individuals repeated in a non-random fashion.

4) Seasonal changes in trap success were noted.

5) It is suggested that trap reaction be given consideration where studies involve the use of banding data.

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THE POSTJUVENAL MOLT OF THE MALE BROWN-HEADED COWBIRD (Molothrus ater)

BY JAMES BAIRD

The differentiation of sex and age groups is of vital interest to banders, life history workers, and others who have to deal with living birds. Some species of birds are characteristically plumaged whether male or female, adult or immature, or any combination of the above. However, the majority have one or more stages in their plumage development which cause difficulty in identifying with certainty the age and sex of an individual. In the Brown-headed Cowbird, *Molothrus ater*, this difficulty is evident in several stages of the plumage development: 1) the *natal down* presents obvious difficulties; 2) the *juvenal plumage*, in which both sexes are colored alike, and where the only distinction is that of size; and 3) upon completion of the postjuvenal molt *(1st winter plumage)*, where there is sexual dimorphism, but where the adults and immatures are nearly alike in color. It is this last-mentioned problem that is under discussion, for I believe that there are differences which allow the immature male and the adult male to be separated.

The well-known propensity of a few immature male cowbirds to retain a number of juvenal feathers, including even rectrices and remiges, in the 1st winter plumage has been commented upon by a number of authors (Dwight, 1900; Forbush, 1927; Friedmann, 1929). These birds were generally dismissed as anomalies or as individuals that were not in the best of health. My own interest in the subject arose from just such individuals, and the matter was investigated in my search for a further refinement of data on cowbird weights. Over 1,200 cowbirds, more than half of which were males, were weighed and banded at the Norman Bird Sanctuary, Middletown, Newport County, Rhode Island. These were all examined closely and notes were made on the plumage. The majority were captured during the winter and spring of 1957 and in the winter of 1958. Random sampling, by collecting, of a migrating flock composed largely of molting immature birds on September 22, 1957, resulted in the accumulation of additional data on seven males that were in active molt. An important standard of reference for known adults was provided by the returning of males banded in previous years.

A brief review of some of the cowbird molts and plumages is in order: Male and female cowbirds are identically olive-brown in the juvenal plumage. In the early fall, males and females alike undergo a postjuvenal molt into the 1st winter plumage, thus allowing the first separation of the sexes by plumage. Dwight *(ibid.)* says of the male in this plumage: "Unlike the previous plumage, chiefly black instead of brown, young birds becoming practically indistinguishable from adults." He states further that the "Adult Winter Plumage (is) acquired by a complete postnuptial molt in September. Adults are not distinguishable, as a rule, from young birds in first winter dress."

Friedmann *(ibid.)* quotes Dwight in full and further elaborates on certain aspects of the plumage coloration. He also contributes a discussion of the order of molt in the immature male. However, he

agreed with Dwight that immature male cowbirds *(M. ater)* could not be distinguished from adults, although in the section dealing with the Shiny Cowbird *(M. bonariensis)* he commented on the fact that 9 out of 10 immature males retained enough of the juvenal plumage to be identified as such in the field.

Bent (1958) again relies on Dwight's description of the plumages and molts, but he errs (p. 442) when he refers to the "postnuptial molt . . . producing a first winter plumage which is indistinguishable from that of the adult" (postnuptial obviously should read postjuvenal).

Forbush *(ibid.)* apparently suspected that the postjuvenal molt was not complete, for this is his description: "first winter plumage acquired by a complete (?) postjuvenal molt; this plumage practically as adult . . .; a few male birds still retain brown feathers. . . ."

Unfortunately, I was unable to examine birds that were in the early stages of molt, and therefore cannot comment on or contribute further to this aspect as discussed by Friedmann *(ibid.)*. My information concerns some of the features of the middle and late stages of the molt, particularly with respect to molt progress within each feather tract.

As noted by Friedman *(ibid.)*, in the course of the postjuvenal molt of the male cowbird the molt proceeds in a set pattern which varies little between individuals. However, as the molt period closes, the peripheral areas of the various feather tracts (the areas that are molted last) may not complete the molt, and this varies considerably among individuals. Thus, the back feathers are molted from the center outward (posteriorly and laterally), and in those individuals in which the molting has stopped before the back molt is completed, the brown feathers of the juvenal plumage are to be found along the outer edges of the back. But it should be noted that the retention of juvenal feathers follows an orderly progression, with one area succeeding another. Retention of juvenal feathers on the back invariably means that juvenal feathers will also be found in the scapulars and underwing coverts. The degree of molt completion varies considerably and may possibly be related to the time of hatching; birds hatched in the early summer may more nearly complete their molt than birds hatched during the late summer.

In the early stages of this study, I felt that the main difficulty lay in determining whether birds which had no trace of the brown juvenal feathers were immatures which had actually completed their molt, or were adults. This still remains a question to be considered, but I now believe that the ageing of male cowbirds can be done with a high degree of accuracy, since apparently the postjuvenal molt of the male is not complete but is arrested at one or another stage of completion. There may be exceptions, but consideration of the proportion of adults to immatures banded indicate that there are few. In 1957 of 585 males banded, 189 (32.3%) were adults, while 396 (67.7%) were immatures. In 1958 (to date) of 166 males banded, 30 (19%) were adults, while 136 (81%) were immatures.

It seems quite likely that the postjuvenal molt of the female cowbird may also be arrested at one or another stage of completion, and the ageing of a few individuals may be accomplished by virtue of the retention of a large number of the juvenal feathers. However, in

dealing with birds which have nearly completed their molt, the similarity in the color of the juvenal and the 1st winter plumage renders detection of vestiges of the juvenal plumage exceedingly difficult.

ORDER OF MOLT COMPLETION AND DIRECTION OF MOLT WITHIN EACH FEATHER TRACT

Head—Friedmann *(ibid.)* stated that "The head feathers are molted in an irregular fashion. . . ." This is not borne out by examination of birds in the middle and late stages of molt. It appears that there is a definite order of molt. The following regions of the head are listed in the order of molt completion (although in several of these regions, the molt is sometimes not completed), with the direction of molt within each region also given:

Nape—completes molt before other areas of the head, Molt centrifugal.
Throat—starts posteriorly, proceeds anteriorly and laterally.
Lores—centripetal molt.
Crown—posterior and lateral progression.
Forehead—anterior progression.
Chin—anterior and lateral progression.
Malar area—anterior progression.
Auriculars—general.
Orbital area—general. Incomplete molt in 9% of the immature males examined.

The head color of the immature in fresh fall plumage is strongly tinged with purple. During the course of the fall and winter this purple tinge disappears, leaving the head brown. Dwight *(ibid.)* states that the "First Nuptial Plumage [is] acquired by wear, which shows very little and chiefly in the paler brown of the head." This statement is correct to the extent that there is no prenuptial molt, but the paler brown of the head is not brought about by wear, as is the color change in the breast of the Robin (i.e., the wearing away of the feather tip which is a different color from that underlying the tip). Examination of the individual feathers of the head reveals that there are no purple edgings to the feathers, each feather being essentially unicolored and purple tinged, with some individuals even having strong buffy edging of the feathers. Friedmann *(ibid.)* alluded to the true situation when he said that apparently the purple color gradually faded out leaving the brown more noticeable. Additionally, it appears that the postnuptial molt of the adult results in less purple in the head than in the postjuvenal molt of the immature. Spring adults known to be more than a year old have a paler, more golden brown head, especially the nape, than the immature male.

Body—Friedmann *(ibid.)* assigned an order of molt to the feather tracts of the body. While it is probable that molt starts in one area before another, examination of birds in the middle and late stages of molt reveals no area other than the breast significantly advanced over another.

Scapulars—posterior progression. The last two feathers are frequently not molted (92% of the immature males examined).
Back—posterior and lateral progression. The outermost feathers not molted in 23% of the immature males examined.

Belly—posterior and unilateral (ventral) progression. Mid-line of the belly infrequently not molted (23%).
Sides—posterior and unilateral (dorsal) progression.
Breast—posterior progression. Molt completed early.
Flanks—posterior progression.
Rump—posterior and lateral progression.

Crural area—molt proceeds downward.

Wing—Molt begins in the wing with the upper wing coverts, which complete their molt well in advance of the remiges. Some birds retain the innermost juvenal upper wing coverts. The primaries are molted from the innermost outward (1, 2, 3, . . . 9), and each primary covert is molted with its primary. Infrequently the 8th and the 9th primaries are not molted. Friedmann *(ibid.)* reported that the secondaries were molted from the outermost inward. Exception must be taken to this statement in that all specimens examined had the 6th secondary fully grown, while nos. 3, 4 and 5 were still juvenal. It would appear that secondary no. 1 is molted first, the 6th next, and the molt then proceeds inward in the following order: 2, 3, 4 and 5. The secondary coverts are replaced irrespective of the order of molt of the secondaries. The tertials are molted early, probably with the 1st and/or 6th secondary. The feathers of the alula are molted simultaneously, and during the later stages of the wing molt, frequently with the 8th and 9th primaries. The underwing coverts[1] are subject to a great deal of variation in completeness of molt. All or most of the underwing coverts were of the juvenal plumage in 71% of the immature males examined. All had the outermost row of the inverted undercoverts juvenal, although some had a scattering of feathers of the 1st winter plumage. Recognition of these juvenal feathers is always essential in determining the age of an immature which has almost completed the postjuvenal molt—the feathers of the juvenal plumage are light brown with a dull sheen, while the feathers of the 1st winter plumage and subsequent adult plumages are a silvery gray with a strong black edging to each feather. The direction of molt of the underwing coverts is from the innermost outward, with the *pteryla patagialis corridorii* and the innermost inverted undercoverts being molted first, then the lesser undercoverts, and lastly portions of the outermost inverted undercoverts.

Tail—Friedmann *(ibid.)* suggests that the molt of the upper tail coverts occurs at the same time as, and as part of the rump molt. That this is not so can be seen by referring to the direction taken by the rump molt, in which new feather growth starts anteriorly and centrally, spreading laterally and posteriorly, thus placing in juxtaposition ensheathed feathers of the lower rump and the fully grown new feathers of the upper tail coverts. The upper tail coverts start the molt anteriorly, spreading posteriorly and laterally. The last two feathers to be replaced are the central pair lying above the central rectrices. The same exception is taken to Friedmann's statement concerning the undertail coverts being related in their molt to that of the belly. The molt of the undertail coverts proceeds posteriorly and laterally, as in the upper tail coverts, and the last feathers to be molted are the central pair underlying the central rectrices.

[1]Terminology for description of underwing as in Blake (1956).

I could find no evidence that the rectrices are molted in the order suggested by Blake *(ibid.)*—5, 6, 4, 3, 2, 1. But possibly molt inception is obscured by the time the feathers are half grown. On the basis of the specimens which I examined, I would have said that the molt proceeds in the order: 6, 5, 4, 3, 2 and 1.

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BRIEF CONCLUSIONS FOR THE BANDER

1. At any season, a male Brown-headed Cowbird which shows no olive-brown feathers mixed with the black (on close examination) can be termed an adult with reasonable safety.
2. Male Brown-headed Cowbirds which do show olive-brown feathers mixed with the black are definitely immature (for a period of roughly one year, from postjuvenal molt to first postnuptial molt).

SUMMARY

1. Evidence is presented that the postjuvenal molt of the male Brown-headed Cowbird is not complete.
2. The areas of the body which most frequently retain vestiges of the juvenal plumage are those parts of the various feather tracts that are molted last. In decreasing order of frequency they are:
   Outermost row of the inverted undercoverts of the underwing.
   The last two feathers of the scapulars (humeral tract).
   One-quarter to all of the underwing coverts.
   The outer edges of the back (spinal tract).
   The mid-line of the belly (inner edges of the ventral tracts).
   The orbital area of the head.
   Other areas: primaries, secondaries, flanks, etc.
3. There is a progression in the degree of molt completion that follows the order given above.

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BANDING CATBIRDS AT NORRISTOWN

By RAYMOND J. MIDDLETON

Catbirds *(Dumetella carolinensis)* are abundant summer residents of southeastern Pennsylvania. In the last forty-five years we have one record of an individual wintering during 1955-56. This species arrives in this area the last few days of April and becomes common by the first or second day of May.

An abundance of shrubbery suitable for nesting sites surrounds our home; beyond this, many tartarian honeysuckle bushes were planted. Wild thickets have grown up between the yard and a small decidous woods 250 feet to the north. On the southwest side of this woods is an evergreen planting of about an acre, mostly consisting of white pines planted in 1927. Just in front of the pines is an immense blackberry thicket, and many mulberry and wild cherry trees grow to the south of our home. It seems as though this area of some four to five acres was especially made for Catbirds as they are the most abundant of any species during the summer season.

The nesting period is well under way late in May and the first young are out of the nests and into the traps the last five days of June. The earliest capture was June 17th and the latest date for the first young to enter the traps was in 1950 on July 14th. This species is easily captured, readily going in Modesto or Chardonneret traps with bread or soda crackers as bait. We also use 10 thrush traps, 5 of which have the same bait while 5 have water drips. The thrush traps catch the majority of the young; in many instances 3 or 4 are taken at one time (we believe these groups are out of the same nests).

During late June, July and August, at least 75% of the young taken are caught quickly after leaving the nests, many being barely able to fly. It is difficult to believe that so many come from nests on the grounds, yet we know they could not have flown any distance when first taken.

July is the best month for taking young of the year. During early August there is a slight letup until the second broods are out; if the second nesting is good then the last half of August and the first week in September bring many new young into the traps. In the last half of September their number slow down. Now when the molt is completed it is difficult and often impossible to separate the adults from the young of the year. By the first of October many have departed for the wintering grounds; the population now dwindles rapidly and few are seen after the 15th.

We began banding in July of 1921. For the next seven years we had one sparrow trap in use and 14 of this species were taken with no returns. From 1928 on many new traps were built, mostly much more suitable for taking this species. Table 1 shows the total captures to January 1st, 1958.

TABLE 1

Number banded	3,993
Number of repeats	2,159
Number returned	213
Recovered elsewhere	12

TABLE 2 shows the division of the age groups.

TABLE 2

	Adult	Immature	Age Unknown	Totals
Banded	890	2,963	140	3,993
Repeats	659	1,495	5	2,159
Returns	105	106	2	213
Recoveries	1	10	1	12

In Table 3 we have listed the percentages of the returns. All captures of new birds for 1957 have not been included as of April 1st they have not had the opportunity to return.

TABLE 3

	Banded	Returns	Percentage
Adults	845	105	12.4
Immatures	2,834	106	3.8
Age unknown	135	2	1.5
Average of all groups			5.6

In Table 4 we have listed all captures of the different groups for each of the years 1943 to 1957 inclusive. By adding the returned birds and the adults banded we have the total adult birds known to be present each year; it is interesting to compare this with the total young taken each year.

TABLE 4

	Returns	Adult	Immature	Age Unknown	Annual Totals
1943	5	43	135	5	183
1944	3	27	124	8	159
1945	5	11	79	3	93
1946	10	15	97	5	117
1947	10	31	134	3	168
1948	6	26	62	6	94
1949	8	30	96	14	140
1950	6	40	101	6	147
1951	5	45	176	10	231
1952	9	46	176	9	231
1953	12	27	101	1	129
1954	7	64	155	6	225
1955	7	27	156	8	191
1956	11	48	146	4	198
1957	17	45	129	5	179

THE RECOVERIES

For this group we have included all individuals recovered more than two miles from place of banding. Seven of the 12 are worthy of special mention.

One adult, No. 50-231492 banded on July 25, 1952, was found dead the following June 15th, 6 miles east of here; apparently this was a change in nesting territory.

One, age unknown, No. 36-229697 banded on September 14, 1937, was found dead June 2, 1939, 20 miles west of us.

One immature, No. 48-287152 banded on July 24, 1951, was killed by a cat on June 10, 1952, 5 miles southeast of us.

One immature, No. 34-204329 banded August 27, 1934, was found 4 miles north of here on May 27, 1935.

One immature, No. 34-249275 banded on July 19, 1935, was found 15 miles east of here on May 11, 1936.

One immature, No. 42-214699 banded August 17, 1943, was found dead near Litchfield, Connecticut, on February 9, 1947.

One immature, No. 44-212778 banded August 1, 1947, was killed as it flew into a door during a storm at Miami, Florida, on November 11, 1947. This bird had repeated in the traps on August 3rd, so was recovered 100 days after being known to be present in banding area.

THE RETURNS

Of the adults that returned we find the following:

11 were present for 3 years
4 " " " 4 "
1 was " " 5 "
1 " " " 6 years
1 " " " 7 "

16 did not return until 2 years after banding
3 " " " " 3 " " "
1 " " " " 4 " " "

Of the birds banded as immatures, we find that—

8 were present for 3 summers
3 " " " 4 "
1 was " " 6 "
1 " " " 7 "

16 did not return until 2 years after banding
5 " " " " 3 " " "
1 " " " " 4 " " "

Among the returns we find 3 banded as immatures and 4 as adults that deserve listing their complete records separately, as follows:

Adult No. 41-225076 banded May 19, 1942
Return 1 May 17, 1943
" 2 May 5, 1947

Adult No. 42-230728 banded September 6, 1943
Return 1 May 6, 1945
" 2 May 5, 1946
" 3 May 16, 1947
Return 4 on April 30, 1948
" 5 on May 5, 1949

Adult No. 42-214598 banded June 19, 1943
Return 1 on May 4, 1944
" 2 on May 9, 1945
" 3 on June 29, 1946
" 4 on May 12, 1947
" 5 on May 8, 1948
" 6 on May 27, 1949

Immature No. 42-237601 banded July 24, 1945
Return 1 on June 24, 1946
" 2 on May 21, 1950

Adult No. 38-237201 banded June 23, 1938
Return 1 on May 13, 1939
" 2 on May 29, 1940
" 3 on May 10, 1941
" 4 on May 8, 1942
" 5 on August 19, 1943

Immature No. B231682	banded	August	6, 1933
	Return 1	on May	8, 1934
	" 2	on May	1, 1935
	" 3	on April	30, 1936
	" 4	on June	27, 1937

This bird was killed May 2, 1938, as it flew into a windowpane during severe electrical storm at night, a quarter mile southwest of banding station, almost back home but not quite all the way.

Immature No. 47-209742	banded	July	16, 1948
	Return 1	on April	30, 1950
	" 2	on May	11, 1951
	" 3	on May	5, 1952
	" 4	on April	27, 1953
	" 5	on June	9, 1954
	" 6	on May	8, 1956

Note that this bird was not taken during two years, 1949 and 1955; if it was present and not captured then it spent nine summers here.

AGE SUMMARY

105	Adults	and . . .	38	Immatures	lived	to	be	2	years	of age
34	"	"	18	"	"	"	"	3	"	" "
14	"	"	9	"	"	"	"	4	"	" "
8	"	"	3	"	"	"	"	5	"	" "
5	"	"	1	"	"	"	"	6	"	" "
1	"	"	1	"	"	"	"	7	"	" "
			1	"	"	"	"	8	"	" "

We knew adults to be at least one year of age when banded and have so listed them in all of the records. It should be noted that many may have been older than this.

It should be kept in mind that many more returns and age records may be secured in the next few years before birds banded prior to the year 1957 will be written off the record books as time completes their life cycles.

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NEW DESCRIPTIONS OF NATAL PTERYLOSIS OF VARIOUS BIRD SPECIES

BY DAVID KENNETH WETHERBEE

The descriptions of natal down distribution presented in this paper supplement those compiled previously (Wetherbee, Clark University Bull., **24:** 34.35, 1952; and Bull. Amer. Mus. Nat. His., **113:** 339-436, 1957). These new descriptions were made from ideal material, artificially incubated, spontaneously hatched chicks. The data show that the previous descriptions, cited above, made with some misgivings from nestlings in nature were surprisingly representative—natural abrasion of neossoptiles in early postnatal life is negligible, even in the remarkable study skin preparations of natal passerines in the Royal

Ontario Museum of Ontario The majority of these new natal down descriptions are of species heretofore unexamined critically in this regard by ornithologists.

In 1956 Mr. Aretas A. Saunders published his journal notes on newly-hatched passerine birds *(Bird Banding*, **27**: 121-128). Errors of omission and commission in Saunders' notes have already been noted (Wetherbee, 1952, *loc. cit.)*. These notes Saunders had generously contributed to us in 1951 without our knowledge of his publication plans. His "patches" have the following equivalences in terminology: "dorsal patch": spinal region; "humeral patch": scapular region; "caudal patch": rectrices; "secondary and primary patches": secondary and primary coverts; "lateral patch": axillar and pectoral regions. Saunders' belief that ocular region down is limited to clamatorine birds is incorrect.

Dieter Burkhardt *(Revue Suisse de Zoologie*, **61**: 551-633, 1954) published a major paper on *"embryonalen Pterylose einiger Nesthocker"* which brings up to date much information on chiefly Old World Species. Grateful acknowledgement is made to Dr. M. M. Nice for information volunteered.

Ruby-throated Hummingbird. *Archilochus colubris.* Although general reference works refer to hummingbirds as naked, they have in fact a rather heavy neossoptile growth at hatching on the mid-dorsal region. These downs were tawny, 4 mm. in length and numbered twelve pair on each of two specimens. The ephippial apterium that the downs enclosed was relatively long.

Belted Kingfisher. *Megaceryle alcyon.* Without natal down on six specimens examined.

Yellow-shafted Flicker. *Colaptes auratus.* Without natal down on ten specimens examined.

Downy Woodpecker. *Dendrocopos pubescens.* Without natal down on four specimens examined.

Great Crested Flycatcher. *Myiarchus crinitus.* To the fragmentary data given previously can be added 8 neossoptiles each on the greater and middle secondary coverts and a single adventitious down on the proximal secondary. The single specimen examined was noted to have a relatively long ephippial apterium.

Least Flycatcher. *Empidonax minimus.* The data given previously and thought incomplete proved to be fully representative by examination of two prime specimens.

Horned Lark. *Eremophila alpestris.* Neossoptiles had the following distribution on two specimens: ocular 9, coronal 14, occipital 9, middorsal 9 (enclosing apterium), pelvic (entire) 7, scapular 10, femoral 12, abdominal 5, greater secondary covert 10, middle secondary covert 7, and carpal remex covert.

Tree Swallow. *Iridoprocne bicolor.* Fourteen additional specimens corroborated previously given averages. One specimen had a short adventitious neossoptile on the femoral region.

Bank swallow. *Riparia riparia.* Fifteen additional specimens corroborated previously given averages but boosted middorsal region average to 5 neossoptiles. Two specimens showed adventitious femoral neossoptiles. The scapular downs were usually at each end of that region.

Rough-winged Swallow. *Stelgidopteryx ruficollis.* Five additional specimens corroborated previously given averages. One specimen showed an adventitious femoral neossoptile.

Barn Swallow. *Hirundo rustica.* Twelve specimens showed the following average down distributions: coronal 8, occipital 5, middorsal 5, scapular 8, femoral 1. There were no rectrices.

Cliff Swallow. *Petrochelidon pyrrhonota.* Data from six specimens added the abdominal region (4 neossoptiles) to the natal pterylosis of this species, occurring as often as not. The secondary was not regularly downed. Down was sporadically absent from both scapular and femoral regions.

Common Crow. *Corvus brachyrhynchos.* Two specimens corroborated previous data. Five neossoptiles were found on the ocular region of one specimen.

Black-capped Chickadee. *Parus atricapillus.* Six specimens showed the following average neossoptile distributions: coronal 6, occipital 4, middorsal 4, and scapular 5.

Carolina Chickadee. *Parus carolinensis.* Three specimens showed the following average natal pterylosis: coronal 4, occipital 3, middorsal 3, and scapular 3.

White-breasted Nuthatch. *Sitta carolinensis.* Eight specimens showed average down distribution on the following regions: coronal 8, occipital 6, middorsal 6, and scapular 7. There was no ephippial apterium.

Dipper. *Cinclus mexicanus.* Dr. John H. Brandt of Durango, Colorado, kindly contributed a just-hatched Dipper that had long slatey-gray down on the following regions: coronal 14, occipital 8, middorsal 7, pelvic (upper) 2, and scapular 7. There was no ephippial apterium. The "saddle" was well forward, not situated caudal as in thrushes.

Bewick's Wren. *Thryomanes bewickii.* Neossoptiles on two specimens had the following distributions: coronal 4, occipital 4, middorsal 2, pelvic (upper) 1, and scapular 2.

Carolina Wren. *Thryothorus ludovicianus.* Two nearly hatched specimens had long black down on the following regions: coronal 4, occipital 4, middorsal 3, pelvic (upper) 2, and scapular 2.

Mockingbird. *Mimus polyglottos.* Five specimens showed the following average natal pterylosis: ocular 7, coronal 16, occipital 5, middorsal 9, pelvic 10, scapular 8, femoral 11, abdominal 12, crural 5, rectrices, greater secondary covert 9, and middle secondary covert 8.

Brown Thrasher. *Toxostoma rufum.* Three specimens from three nests showed the following down distributions: ocular 12, coronal 16, occipital 4, middorsal 11, pelvic 11, scapular 8, femoral 13, abdominal 8, crural 7, rectrices, under rectrix covert 2, secondary 1, greater secondary covert 9, middle secondary covert 8, carpal remex covert, and alular 1.

Robin. *Turdus migratorius.* Description previously given was substantiated. The upper pelvic region was downed as often as not. The biserial middorsal region extended much further posteriorly in this species than in most passerines.

Wood Thrush. *Hylocichla mustelina.* Five specimens from five nests showed the data previously given to be representative; one specimen, however, hatched with only coronal and occipital down.

Veery. *Hylocichla fuscescens.* Two specimens had the following neossoptiles: coronal 4, occipital 1, middorsal 6, pelvic (upper) 2, and scapular 2.

Blue-gray Gnatcatcher. *Polioptila caerulea.* Without neossoptiles on twelve specimens examined.

Cedar Waxwing. *Bombycilla cedrorum.* Without neossoptiles on three specimens examined.

Loggerhead Shrike. *Lanius ludovicianus.* One specimen showed five short white downs on the ventral abdominal region and on the secondary coverts and rectrices.

Black-capped Vireo. *Vireo atricapillus.* One specimen kindly contributed by Dr. Richard R. Graber was without neossoptiles.

White-eyed Vireo. *Vireo griseus.* Without neossoptiles on five specimens examined.

Bell's Vireo. *Vireo bellii.* One specimen kindly contributed by Dr. Richard R. Graber was without neossoptiles.

Red-eyed Vireo. *Vireo olivaceus.* Four specimens substantiated data previously given with the addition of adventitious presence of neossoptiles on the pectoral and post auricular regions and carpal remex covert. The middorsal region was flared like that of a swallow, sometimes with irregularly situated neossoptiles lateral to the uniserial row. The pelvic region downs were confined to the posterior part.

Philadelphia Vireo. *Vireo philadelphicus.* One specimen had the following neossoptiles: ocular 4, coronal 8, occipital 4, middorsal 13 (7 along ephippial apterium and 6 lateral to this row), pelvic (lower) 6, scapular 12, femoral 10, pectoral 1, axillar 4, abdominal 19, crural 4, rectrices, secondary 3, greater secondary covert 8, middle secondary covert 10, and carpal remex covert.

Warbling Vireo. *Vireo gilvus.* One specimen had the following white neossoptiles: coronal 10, occipital 3, middorsal (flared) 6, pelvic (upper) 1, (lower) 4, scapular 14, femoral 8, abdominal 15, crural 2, rectrices, secondary (proximal) 4, greater secondary covert 8, and middle secondary covert 8.

Black-and-white Warbler. *Mniotilta varia.* One specimen showed heavy brown neossoptiles with the following distribution: coronal 10, occipital 4, middorsal 3, pelvic (upper) 1, scapular 6, femoral 6, and greater secondary covert 3.

Prairie Warbler. *Dendroica discolor.* Two specimens had the following average down distribution: coronal 8, occipital 4, middorsal 2, pelvic (upper) 2, (lower) 2, scapular 6, femoral 7, abdominal 4, crural 1, rectrices, greater secondary covert 5, and middle secondary covert 4.

Yellowthroat. *Geothlypis trichas.* Four specimens from four nests showed the following average natal pterylosis: coronal 4, occipital 4, middorsal 2, pelvic (upper) 2, and scapular 4.

Yellow-breasted Chat. *Icteria virens.* Dr. Richard R. Graber kindly contributed one specimen that was without neossoptiles.

Baltimore Oriole. *Icterus galbula.* Two specimens showed the following average neossoptile distribution: coronal 16, occipital 6, spinal 37, scapular 11, femoral 14, abdominal 14, crural 10, rectrices, under rectrix covert 1, primary 5, greater primary covert 7, secondary

3, greater secondary covert 10, middle secondary covert 8, lesser secondary covert 3, carpal remex covert, and alular 3.

Brown-headed Cowbird. *Molothrus ater.* Examination of five specimens failed to show the secondary region neossoptile that was previously thought to be diagnostic in this species.

Scarlet Tanager. *Piranga olivacea.* Two specimens had neossoptiles distributed as follows: coronal 13, occipital 4, spinal 35, scapular 9, femoral 13, abdominal 12, crural 7, rectrices, primary 10, greater primary covert 8, secondary 2, greater secondary covert 9, middle secondary covert 8, and carpal remex covert.

Cardinal. *Richmondena cardinalis.* One specimen had the following natal pterylosis: coronal 6, occipital 4, middorsal 6, pelvic 9, scapular 8, femoral 8, greater secondary covert 7, middle secondary covert 6.

Rose-breasted Grosbeak. *Pheucticus ludovicianus.* Three specimens had the following average natal pterylosis: coronal 14, occipital 5, spinal 30, scapular 7, femoral 16, abdominal 14, crural 4, rectrices, secondary 2, greater secondary covert 10, middle secondary covert 8, and carpal remex covert.

Lark Sparrow. *Chondestes grammacus.* One specimen kindly contributed by Dr. Richard R. Graber had the following distribution of neossoptiles: ocular 2, coronal 11, occipital 5, middorsal 6, pelvic 12, scapular 8, femoral 13, abdominal 12, crural 7, rectrices, greater primary covert 6, greater secondary covert 9, and middle secondary covert 7.

Field Sparrow. *Spizella pusilla.* Three specimens corroborated previously given data. The crural downs, numbering 2, and the lower pelvic downs, numbering 6, were present characteristically.

Swamp Sparrow. *Melospiza georgiana.* Seven specimens had the following average natal pterylosis: coronal 9, occipital 4, middorsal 6, pelvic (upper) 1, (lower) 6, scapular 5, femoral 8, abdominal 3, and greater secondary covert 7. Adventitiously there were three neossoptiles on the posterior ocular region, two on the proximal secondaries, and two on the distal middle secondary coverts.

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A NEW WATERFOWL NEST TRAP[1]

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Special studies of territorial behavior, renesting activities, homing, and other aspects of waterfowl biology sometimes require that nesting females be marked to permit future identification. Some of the traps and techniques used to capture nesting hens were reviewed by Dzubin

[1]Contribution from the Maine Cooperative Wildlife Research Unit, Orono, Maine; Maine Department of Inland Fisheries and Game, University of Maine, Wildlife Management Institute; and the U. S. Fish and Wildlife Service cooperating. The author expresses his appreciation to Warden Erwin Bonney, Maine Department of Inland Fisheries and Game, to William Miller and Neil King, Vermont Fish and Game Service, for suggestions concerning modification of the original trap, to Howard L. Mendall, Leader, Maine Cooperative Wildlife Research Unit, for reviewing the manuscript, and to Claude Westfall, University of Maine, for the drawing.

and Munro (1956); and more recently, Weller (1957) presented details of an automatic nest trap.

Most of the methods described have practical application under some conditions or for particular species of ducks. However, none is reported to be effective in capturing most species of laying hens. During current studies of the Black Duck *(Anas rubripes)* it soon became apparent that any conspicuous object placed at the nest was likely to cause desertion. Even the less wary Ring-necked Duck *(Aythya collaris)* deserted if trapping were attempted during the early stages of incubation when any type of a conspicuous trap was employed. Our experiences are similar to those of Sowls (1955) and of Dzubin with mallards. Referring to the drop trap that he used, Sowls stated "Trapping success was high in most species of ducks, but low in mallards, which proved suspicious and wary." Dzubin (Dzubin and Munro, *op. cit.)* reported only 30 per cent success in trapping mallard hens.

To overcome these disadvantages some workers have used throw nets and hand nets. These techniques have been applied with varying success, but their effectiveness depends upon the type of nesting cover, skill of operator, weather conditions and other variable factors.

Unaware of the trials by Gollop and Munro with a technique described as the blanket net trap (Dzubin and Munro, *op. cit.)*, we began to experiment with an almost identical technique in 1954. Unframed pieces of two-inch mesh gill net were laid over the cover at nests situated in sites with a dense overhead canopy of shrubs. This technique is very successful at some kinds of nest sites. Some hens, however, do become wary of the overhead net and slip from the nest at the slightest hint of danger. Use of two-inch mesh netting, rather than one-inch mesh, proved more effective in that the hen becomes well entangled and is not as likely to work out of the net.

The need for a device with more universal application resulted in attempts to develop a simple trap that could be concealed at the nest. It also appeared desirable that such a trap should not require excessive alteration of the dense cover characteristic in many of the northeastern breeding marshes, since too much disturbance of cover also causes some desertion and encourages predation.

The trap described in this paper has been used since 1954 with slightly over 80 per cent success. Thirty-two hens have been taken in a variety of marsh and upland sites. Failures have resulted largely from trapping attempts under unusual conditions where it was impossible to approach within 100 yards of the nest site without causing the hen to flush, or walk from her nest. Occasional failures have also resulted when the trap was improperly set, or when a nesting hen disturbed the set in some of our earlier trials before we learned how to overcome this.

We have not yet had an opportunity to attempt to trap hens during the first half of the laying period. However, females have been taken from nests that were in all stages from the late laying period to late incubation.

The trap resembles a basketball net in general appearance. It consists of a stiff, but flexible, hoop with a 26-inch cylinder of two-inch mesh netting. The open end of the netting is provided with a purse

string. In operation, the netting is folded on the hoop and then the entire ring, consisting of hoop and netting, is placed around the nest (Fig. 1). The hoop is pegged to the ground. The pull cord is attached to the draw string and placed through a loop that is fastened to a stake, bush or limb over the nest. A quick pull of the cord at a point 30 to 100 yards from the nest causes the net to extend up and over the bird. At the same time this action purses the open end of the net.

Each 17-inch diameter trap requires the following materials:

Hoop—53 inches No. 6 electrical cable or similar material. It is important that the hoop be stiff, yet flexible enough to permit adjustment to conform with the irregular nature of the terrain at the nest site.

Net — 1 piece nylon netting, 2-inch mesh, 53 inches long, 26 inches wide. Actually, it is more satisfactory if the net is made on the hoop, much in the same manner that an ordinary dip net is constructed. A 26-inch cylinder of netting, for a 17-inch diameter trap may be woven from approximately 105 yards (less than one ounce) of size .022 inch nylon twine. The open end of the net should be provided with a series of loops for a draw cord, or purse string. The color of the net should blend with the materials usually associated with the nest sites.

Purse string—Approximately 70 inches of any hard finish, strong cord. To avoid tangling of lines, it is helpful, when setting the trap, if the color of this cord is slightly different from that of the netting.

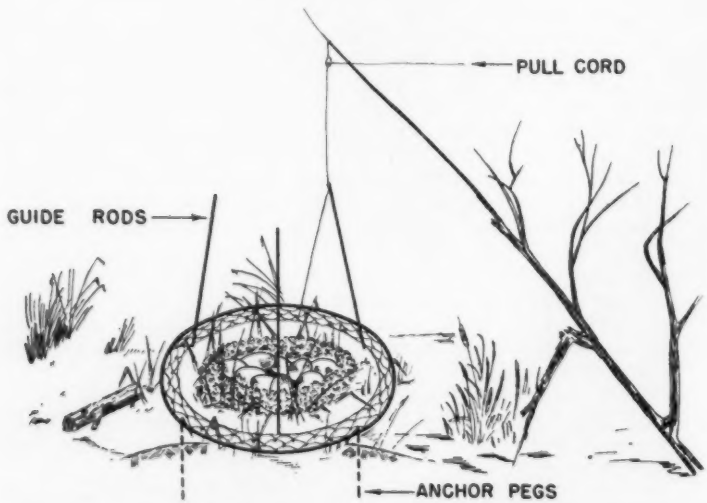

Fig. 1. A sketch showing details of the nest trap and of a completed set.

Pull cord or trip cord—20 to 100 yards of strong, hard finish cord. This cord should not have excessive "stretch."

No other materials except anchor pegs and guide pins are needed for operation. These may be cut on the spot from any convenient tree or bush. The guide pins may consist of rigid, smooth stems of local plants or of metal rods 18 inches to 24 inches long.

Preparations for use of the trap at a nest site involve the following:

1. *Provision for an anchor above the nest.* To provide the vertical motion for the trap, the pull cord must be anchored through a loop attached to some object 3-5 feet above the nest. Sometimes a bush or a limb already over the nest will serve this purpose. Usually, however, it is necessary to place a stake, 5 to 7 feet long and 1 to 1½ inches in diameter near the nest and in such a manner that it leans over it. A pole with a few small branches and leaves is suitable and blends with the cover better than a bare pole.

2. *Determination of the best approach for operation of the trip cord.* Points to consider include behavior of the hen, density of cover, prevailing winds, nearness to other known nests, and the usual route taken by the duck when she leaves and returns to her nest.

A person working with nesting waterfowl will, from past experience, have some idea as to how the species in question reacts to disturbance and how its reaction varies with different cover and weather conditions. In situations where a bird is inclined to be wary, a long pull cord (60 to 100 yards) is needed.

3. *An examination of the character of the ground or marsh at the nest site.* The hoop of the trap should be firmly anchored if possible. Soft, floating bog sites often require anchor pegs 18 inches long, whereas at nests on firm loam 6- or 8- inch pegs are sufficient.

The trap may be set when the nest is first located. However, it is usually best to wait one day or more to permit the duck to make at least one return trip to the nest before any additional disturbance to the site is made. Even though the trap is well concealed, some disturbance to the nest site and the surrounding cover is unavoidable. A female that is especially wary may not desert, but she will often slip from her nest and stand beside it at the slightest hint of danger.

The trap is set and operated in the following manner:

1. The observer proceeds to the nest with trap and with pre-cut anchor pegs and guide pins. All materials should be ready for use. This is important since any extra movement to obtain pegs, cord, or trap disturbs the cover more than is necessary. With a little practice it should be possible to make most sets by merely walking to the nest, remaining with feet in one position, and leaving the nest without disturbing much of the cover around it.

2. The pull cord is inserted in the loop in the overhead limb or stake. One end is attached to the drawstring on the top of the net. The pull cord should be on that side of the nest from which the duck is expected to attempt to depart. This is because the side of the netting attached to the cord will lift slightly ahead of the rest of the perimeter of the netting.

3. The trap is carefully lowered over the nest. To accomplish this it may be necessary to part the plants around the nest site. This should be done in such a manner as to break as few stems as possible.

4. The hoop is bent to conform closely with the terrain about the nest and is anchored in place by the pegs. Depending upon the ground cover, the hoop and pegs should be virtually concealed with the material at hand.

5. The net is carefully folded over the hoop or close to it. It, too, may be almost completely concealed if this seems necessary for the situation in question.

6. Guide rods are inserted inside the circle of folded netting (see Fig. 1). The guide rods serve two functions, viz., they insure that the net will not purse or close until it has passed above the hen; also the rods prevent the bird from pulling the netting out of place. During laying and the early stages of incubation, nesting ducks gather new material by reaching out to grasp that which is within their reach while on their nests, as described by Sowls (1955). The guide rods prevent the hen from disarranging the netting to the extent that it will not pull properly when the trap is sprung.

7. When the set is complete the pull cord is pulled through the loop, provided in the overhead limb or stake, far enough to take up any slack cord about the trap. To keep the cord from blowing in the wind, and also to reduce the chance of the bird plucking at it and disrupting the set, the cord must be anchored. This is easily accomplished by making a slit in the end of one of the guide rods. The cord is placed in this slit (see Fig. 1). It is thereby anchored sufficiently to prevent the wind or the bird from moving it too far. Yet, it will readily slip out when the operator pulls the far end of the cord.

8. The pull cord is laid out over the surrounding cover to a point that the operator has selected. This point should be well beyond the anticipated flushing distance of the hen. The cord is tied to a stake at this location. If the cover is dense, the route that the operator will take to reach the end of the trip cord should be clearly marked.

The operator may return to spring the trap anytime when he knows or suspects that the female is on the nest. On our areas the birds under observation usually returned to their nests after periods of 1½ to 3 hours. We have found it convenient to set the traps before 10:00 a.m., devote several hours to work in another section of the area, and then return to spring the traps between 2:00 and 4:00 p.m. In some situations we have set the traps one day and returned to spring them sometime within the next three days. However, the greater the interval, the more chance that the activities of the hen or the influence of weather factors (winds, heavy rains, changing water levels) may render the set ineffective.

The trap is sprung by a fast pull on the end of the pull cord. This causes the net to extend rapidly over the hen and close. The end of the cord may be tied to a stake while the operator approaches the trap to remove the duck.

At some sites (for example, nests on rocky ledges) it will be impossible to secure the hoop with pegs. Sometimes it can be tied to plant

roots. Or, as William Miller and Neil King of the Vermont Fish and Game Service have suggested, the hoop could be made of heavy lead cable to help hold it down. In situations when the trap cannot be anchored as firmly as desired, it is necessary to restrict the length of the action of the pull cord. This may be accomplished by placing a knot in the pull cord between the trap and the overhead anchor loop. The knot should be placed at a point that will permit enough action at the trap to cause it to extend and close over the hen, but not pull far enough to cause the poorly anchored hoop to rise from the ground.

There are several other minor details involved in setting and operating the trap, but they may best be learned from experience under the existing conditions. Needless to say, this technique, like any trapping technique, requires careful attention to many small details.

In the five cases where we have trapped, marked and banded incubating females and left their nests unmolested, each has returned to complete incubation. Some ducks have been trapped twice within a period of three to four weeks.

It seems likely that the trap described may be of use in trapping other nesting birds when this is necessary. With modifications in size it might be adapted for a variety of species. Our initial traps were constructed from scrap material including two-inch mesh gill netting. Later models were made from good grade nylon twine by an experienced net maker at a total cost of $3.00 each.

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GENERAL NOTES

Behavior Notes on the Ipswich Sparrow.—During the spring of 1958, while engaged in migration banding operations on the northern coast of Massachusetts with Carl W. Helms, the author was able to make a few field notes on the behavior of Ipswich Sparrows, *Passerculus princeps*. This species breeds only on Sable Island (off Nova Scotia) and winters uncommonly along the Atlantic coast, and as such has not been studied extensively by field workers. Observations reported below were made on April 5, 6, 13, and 20 at the Parker River National Wildlife Refuge on Plum Island, Mass. Most of the individuals observed were feeding in the same areas with Savannah Sparrows *(P. sandwichensis)* at the water's edge of the man-made empoundments on the western (inland) side of the island. A few were also observed in a brush area where banding mist nets were set up, and one Ipswich was banded, along with several Savannahs. The actual sand dune areas, often cited as the only habitat of the Ipswich, were not investigated.

Feeding and non-social behavior were observed in several individuals. Feeding of the Ipswich resembles that of many ground-feeding emberizines. A bird will move along the ground, pecking intermittently, and then may fly a short distance and begin searching again. The actual pecking movement consists of lowering the head swiftly, while the body is held almost horizontally, and the tail is flicked

slightly, presumably for balance. There appears to be very little lateral motion to the head in the pecking movement. Occasionally, a bird may wade into very shallow water, and peck into it; in which case a lateral shake is given to the head as it is brought up from the peck. This peck-shake seems to function in shaking the water from the head feathers. Locomotion on the ground is running, as opposed to hopping, and the Ipswich is reluctant to fly when chased. Protectively colored, a motionless bird is very difficult to find, and it was noticed that the birds never stop on the light areas of sandy ground, but run over them, stopping only on the darker areas. This appears to be a remarkable behavior trait associated strongly with protective coloration, for one individual repeated the behavior almost a dozen times when pursued by the observer. Locomotion in the air may be described as a weak but fast rowing-wing-beat flight. Flight intention movements consist of sleeking the body feathers, flicking the tail vertically (with no noticeable lateral motion or spread of tail feathers), and flicking the wings slightly at the wrists (at high intensity). The motions correspond well, as far as could be seen, to intensities of incipient takeoff, so that flight intention appears not to have been ritualized for signal purposes in this species. These flight intention flicks are given just before takeoff, and just after landing.

A few comfort movements were also observed. Feather setting (the raising, shaking, and lowering of feathers) is performed on the back and rump area quite often, and is accompanied by a lateral swish of the tail with feathers noticeably spread. One bird was observed to preen its breast briefly, but was not seen to utilize the uropygial gland. Another Ipswich scratched its head by the "indirect" method, the leg passing between the wing and body.

There was ample opportunity to observe social behavior, for Ipswich and Savannah Sparrows often fed together in small groups. When doing so, they utter "tzeet" intermittently, which appears to be a social note. As in many small bird flocks, frequent aggressive encounters take place. On the 5th, I was able to observe at a distance of less than ten feet the social behavior of an Ipswich and two Savannah Sparrows. (I am indebted to Allan Goodridge for confirmation of my field identification of these individuals.) The aggressive posture is the same for both species. The head is thrust forward toward the opponent, and the bill is opened, displaying the gape. In addition, the wings are raised in a quick upward jerk, and the tail may be raised slightly, although the feathers are not spread. The threat posture is frequently accompanied by a running chase by the dominant individual, but rarely ends in flight of either. A note "buzt" or "buzt-buzt-buzt" is sometimes uttered by the dominant individual, and so is assumed to be an aggression note. Infrequently, a "replacement flight" is seen, where one individual flies at another, replacing the latter at the spot from which he fled. Fear response seems to be relatively simple and unritualized, and consists of sleeking the body feathers as in flight-intention, escaping from the opponent by running or flying, and erecting the feathers on the crest. I describe the Ipswich's fear note as "chik," given singly or in groups of two to five; that of the Savannah was indistinguishable from it. In the situation described above, interspecific aggression was free, and the Ipswich won its bouts with one of the Savannahs by posturing, but had little contact with the other.

No sexual displays were observed in the Ipswich. However, the brief songs of three individuals heard on two separate days were noted. Song posts of 4-5 inch high tufts of matted grass were utilized, one individual singing 17 consecutive songs from the same place. The songs heard resembled closely one of the common songs of the Savannah, and may be described as "zi-zi, zetetetetet-etetetet, zit-er-it," the first notes barely being audible, the trill rising then falling, and the last phrase uttered very quickly.

Discussion. There are virtually no other behavior studies on the Ipswich, although a few ethological papers provide comparison on behavior patterns of other emberizine species. The feeding behavior does not seem significantly different from that of the other North American emberizines which I have observed, with the exception of the shake-peck and the protective coloration behavior discussed above. Fight-intention movements for a number of passerines have been described by Andrew (1956a), and the Ipswich supports his generalization that emberizines have large vertical tail flicks with little lateral displacement. However, the Ipswich does not seem to have a great spread of tail feathers, as is reported to be the general emberizine pattern (see also Mayr, Andrew, and Hinde, 1956:265,

Table I.) The feather comfort movement observed agree with those described for European emberizines (Andrew, 1956b), and the head-scratching supports Simmons (1957) and Andrew (1956b) who indicate that the indirect (passerine) method is probably used by all emberizines.

Social behavior affords some comparisons too. The calls of the European emberizines have been studied by Andrew (1957), and although homologies between species would have to be substantiated by audiospectrograph recordings, the Ipswich "tzeet" seems to be close to some of the social "seep" notes of *Emberiza* spp. The threat posture utilizes the same "head-forward" basis as the European emberizines (Andrew, 1956-7). Although gaping is also part of the *Emberiza* display, wing-raising and tail-raising are not. Andrew (1956-7), quoting Sabine, mentions that *Spizella arborea* does use its tail, and I have observed that species and *Junco hyemalis* raising the tail in threat, although other species (e.g. *Passerella iliaca)* do not. *Emberiza* spp. (Andrew, 1956-7), *Junco hyemalis* and *Passerella iliaca* do not use wings in threat, whereas *Spizella arborea* appears to use them (pers. obs.). It does not seem clear at this time whether or not threat display in emberizines is species-specific, but these observations do suggest that it is not the same in all species. Fear response seems to be very similar to *Emberiza* spp. (Andrew, 1956c), and fear-provoked crest raising has been observed by the author in a number of North American emberizines (e.g., *Junco hyemalis, Passerella iliaca, Spizella arborea).*

Specific Status. The question of taxonomic status of the Ipswich does not seem to have been studied seriously since the paper of Peters and Griscom (1938) twenty years ago. On the basis of morphological variation, they considered the Ipswich as not specifically distinct from the Savannah. This was before general acceptance of the modern concept of species as "groups of actually (or potentially) interbreeding natural populations which are reproductively isolated from other such groups" (Mayr, Linsley, and Usinger, 1953:25), and the abolition of the Ipswich met with resistance from taxonomists (e.g., Grinnell, 1939). The A.O.U. Checklist still retains the Ipswich as a species (p. 586), although Eisenmann (in litt.) tells me that even the most conservative ornithologists now believe it to be an insular representative of the Savannah Sparrow. Most of the behavior pattern discussed in this note are usually not significantly different from species to species. Perhaps only the threat display and the song might be expected to be unlike in two species. That these are nearly identical in the Ipswich and Savannah is not proof of conspecificity, of course. These patterns are to be considered merely as taxonomic characters, such as plumage and size, which are often helpful in distinguishing between populations.

The real question, of course, is: "Do reproductive isolating mechanisms between the two forms actually exist?", and no attempt to answer this is made here. It would seem that with the great morphological and behavioral similarities between the Ipswich and the Savannah, the most logical solution might be to follow the trend of modern taxonomy in considering the two forms conspecific until some evidence of an isolating mechanism has been found.

I am grateful to Drs. Andrew J. Meyerriecks, Ernst Mayr, and E. O. Wilson for critical comments on this note.

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Jack P. Hailman, 4401 Gladwyne Drive, Bethesda, Maryland.

Cardinal Banded in Connecticut, Retrapped in Pennsylvania.—On May 2, 1958, I trapped and released at 926 W. Beaver Ave., State College, Pennsylvania, an adult male Cardinal *(Richmondena cardinalis)*, 55-129171, which had been banded on December 13, 1957, by G. Hapgood Parks at 99 Warrenton Ave., Hartford, Conn. Although this bird was not retrapped the evidence indicates that it remained in Hartford until March 14, 1958. Mr. Parks wrote that a banded male Cardinal, which retained the same behavior pattern throughout the period, remained at their feeding trays from the date of banding until March 14. Also, this is the only male Cardinal which they have ever seen at their station. The bird has not repeated in State College, but since there are other Cardinals present, it still could be in the area.—Dorothy L. Bordner, 926 W. Beaver Ave., State College, Penna.

Ed. note: this record is of outstanding interest, for several reasons:

(1) the species is generally considered sedentary, with few recoveries of banded birds at any great distance from the point of banding. State College is about 270 air miles from Hartford, about WSW, so that this is one of the longest trips on record for the species;

(2) the species has been extending its range vigorously. For example, in Connecticut, only two records were known down to 1913, and it did not breed until 1944. By the 1955 Christmas census, 105 individuals were recorded in the Westport area, and birds were reported in 8 towns in the Hartford area. It is believed that the speed of its increase comes at least in part from continued movement of birds into the newly-colonized areas, and the State College recovery suggests that some individuals may retreat southward under the impact of severe weather rather than dying from cold or lack of food. March, 1958 was marked in New England by five severe northeasterly snowstorms, and the apparent effect on the pioneering Cardinals can be measured by the number of places in eastern Massachusetts reporting one or more birds. As reported to the *Records of New England Birds*, by 10-day periods, January, 1958 had a maximum of 23, February 20, the first third of March 10, the middle third 7, and the last third only 2 (2 individuals).

(3) the movement of this Cardinal is curiously reminiscent of the Evening Grosbeaks which were banded in numbers in Connecticut in December, 1955 and January, 1956, at various stations including Mr. Parks' and my own, several of which were retaken at State College, Penna., in early 1958, and others of which were reported from central New York State more-or-less north of State College.—E. Alexander Bergstrom.

The Killing of an Adult Bird by a Blue Jay.—There seems to be some question as to whether or not a Blue Jay *(Cyanocitta cristata)* will kill an adult bird. Bent (Life Histories of North American Jays, Crows, and Titmice, pp. 40-44) quotes Professor F. E. L. Beal as stating: "The most striking point in the study of the food of the Blue Jay is the discrepancy between the testimony of field observers concerning the bird's nest-robbing proclivities and the results of stomach examinations . . .", and Mr. Manly Hardy as stating: "It is a great robber of birds' nests, taking both eggs and young. I also feel quite sure that in some cases it kills adult birds . . .".

On May 20, 1958 I saw a Blue Jay holding a brown Purple Finch with his feet on a branch of a lilac bush just outside my window. The Purple Finch was dangling from the branch and the Blue Jay was hitting it repeatedly on the head with his beak. I rapped sharply on the window and after a few seconds the Blue Jay dropped the finch and flew to a nearby tree. In a few minutes the jay returned to the finch which was lying on the ground beneath the lilac bush. I rapped again on the window and the jay again flew to the tree. I hurried out and picked up the finch which was dead. Its skull had been pierced a number of times and was covered with blood. The finch was one we had banded just two days earlier.—Mrs. James R. Downs, Glebe Farm, South Londonderry, Vermont.

Notes on a Captive Wood Thrush and Its Prenuptial Molt.—On October 10, 1957, in the Savannah River Plant area, Aiken County, South Carolina, I found a Wood Thrush *(Hylocichla mustelina)* which had struck a high-tension wire and had broken one of its wings. My wife and I force-fed the bird for two or three days, after which it began to accept food held by forceps. Within a few days it was taking food and water from dishes placed in its cage. Its staple diet was raw hamburger supplemented with wheat germ; at times bits of eggshell were added, especially when the wing bone (humerus) was healing. Sometimes berries of *Ilex, Vaccinium,* and *Pyracantha* were offered, but only those of *Pyracantha* were eaten regularly. A vitamin supplement was supplied with the water. We found the Wood Thrush, apparently a yearling, to be a quiet, unobtrusive "pet." Occasionally it gave soft *trrrr, trrrr* notes, but usually it was silent. In October and November it exhibited nocturnal unrest, but later the migratory urge subsided. Throughout the winter the bird spent the night perched on top of a wire canary cage which was kept open and was placed near one end of a much larger screen cage. In December a long mirror was set down between the screen and the wall close by, and the spot-breasted image would engage the bird's attention (and seem to induce a measure of "rapt tranquillity") for considerable periods of time. Further diversion was provided by another wing-injured foundling, a Savannah Sparrow *(Passerculus sandwichensis)*—a compulsive bather whose ablutions were usually closely watched by the thrush, which would flick its wings excitedly and peck on the floor of the cage. The pecking was interpreted as substitute or displacement behavior.

Although the Wood Thrush was rarely handled, by mid-February it was apparent that the bird was molting. Pinfeathers were especially in evidence in the crown region. This was of particular interest because Dwight (Ann. N. Y. Acad. Sci., **13**: 73-360, 1900) wrote that in this species the nuptial plumage is acquired by wear, and Bent (U. S. Nat. Mus. Bull. 196: viii + 454, 1949) iterated this statement. A careful examination of our captive on February 26, 1958, confirmed my suspicion that it was undergoing extensive molt. New feathers, mostly still ensheathed, were growing out in all the principal contour-feather tracts. Indeed, as was clearly shown by the head plumage in particular, it seemed that all or very nearly all the individual feathers over the head and body were being replaced. Down feathers scattered over the ventral apterium were being renewed, as were the lesser and middle wing coverts and the inframarginals. Only the remiges, alulae, greater wing coverts, and rectrices were not involved. The presence of such an extensive late-winter or prenuptial molt in this individual suggests that Dwight's statement may well prove to be erroneous. An examination of February- and March-collected skins from Middle America and other wintering areas should throw light on this problem.

Since Dilger *(Sys. Zool.,* **5**: 174-182, 1956) holds that the Wood Thrush is best considered as generically distinct from the four other species usually included in *Hylocichla,* it would be of decided interest to ascertain whether or not these thrushes (Hermit, Swainson's, Gray-cheeked, and Veery) are characterized by prenuptial molt. According to Dwight *(op. cit.)* such molt is lacking in all four. However, it is interesting to note that Wallace *(in* Bent, *op. cit.:* 207) kept a young Gray-cheeked Thrush *(Hylocichla minima bicknelli)* in confinement for a year and reported that the bird "grew a new tail in midwinter [due to accidental loss?] and in spring molted some wing and body feathers. This was interpreted as an abnormal molt due to poor feather condition, but the abrupt change in plumage from winter to spring in some Alaskan graycheeks suggests that spring molts in nature are not unknown." Whether this molt and that of our Wood Thrush are really "abnormal" is admittedly a moot point. Even so, these two instances of molt do serve to raise the question: Does a prenuptial molt occur regularly in members of this group of thrushes? Within the past decade, spring molt has been found to be more extensive in certain fringillids—as LeConte's Sparrow (Tordoff and Mengel, *Auk,* ***68***: 519-522, 1951), the nominate race of Whitecrown (Norris, *Oriole,* **19**: 25-31, 1954), Harris' Sparrow (Woolfenden, *Wilson Bull.,* **67**: 212-213, 1955), and Lincoln's Sparrow (Norris, MS. notes)—than was acknowledged in the earlier literature. Similarly, notwithstanding previous statements to the contrary, it might well be that prenuptial molt is prevalent and extensive in the "*Hylocichla* thrushes."—Robert A. Norris (University of Georgia Ecological Studies, AEC Savannah River Plant area), 1918 Hahn Avenue, Aiken, South Carolina.

RECENT LITERATURE

BANDING

(See also numbers 12, 17, 51)

1. Bird-Banding by the Hungarian Natural History Museum in 1950-1956. L. Horváth. 1957. *Annales Historico-Naturales Musei Nationalis Hungarici*, **8**: 421-424. "The Zoological Department of the Museum suffered very heavy losses during the events of October, 1956, when, among others, also the Ornithological Collection was completely annihilated, together with its special library and the inventory books." Fortunately the records of banding and recoveries from 1950-56 "escaped the over-all destruction." During the 7 years 2,030 birds of 69 species were ringed, 1,100 of these by Koloman Warga, research associate of the Hungarian Ornithological Institute; 44 recoveries are listed. A Red-footed Falcon *(Falco vespertinus)* was taken in Corsica on its spring migration. Of the 448 Night Herons *(Nycticorax nycticorax)* banded, 16 were recovered; four had reached 5 years of age and one 6 years; a 4-year-old bird was found 28 August in the delta of the Volga.—M. M. Nice.

2. Records of birds ringed abroad and found in Hungary, XIX report on ringing. (Külföldi Gyürüs Madarak Kézrekerülései, XIX Gyürüzési Jelentés.) András Keve. 1957. *Aquila*, **63-64**: 165-171. Raw data, not always complete, for 64 Hungarian recoveries of 27 species of birds banded abroad. *Larus ridibundus* heads the list with 18 recoveries, 4 of them from Finland, the rest from Russia and nearby satellites. The coordinates given for all localities are most welcome; they greatly facilitate finding small, little-known places that seldom appear on maps in our atlases.—O. L. Austin, Jr.

3. Recoveries of birds banded abroad, 29. (Terugvondsten van in het buitenland geringde vogels, 29.) C. G. B. Ten Kate and J. Taapken. 1958. *Limosa*, **31**(1): 54-65. Lists the raw data for 300-odd foreign-banded birds of 48 species recovered in the Netherlands since the last report in 1957. Many of these have already been reported in print by the original banders, to whose reports reference is made.—O. L. Austin, Jr.

4. Report on Bird-Trapping in the Zwarte Meer reserve for 1955-1957. (Het Zwarte Meer (Rayon-West). J. A. F. Koridon. 1958. *Limosa*, **31**(1): 1-17. (From the English summary.) The warden of a lowland preserve in the Netherlands describes his trapping in the marshes, mainly with eel-fykes adapted for the purpose, which took rails when set on the ground and a wide variety of passerines when set higher in the marsh grass. In the 3 years he banded almost 2,000 birds of 40 species.—O. L. Austin, Jr.

5. Bird-banding in Finland in the years 1913-1957. Göran Nordström. 1958. *Ornis Fennica*, **35**(2/3): 113-121. In the 5 years since the last general report (1913-1952, see *Bird-Banding* **26**: 120) the Finns exceeded their 128,000 total for the preceding 40 years of banding; their grand total is now 259,307 birds banded of 215 species. As might be expected, the large numbers banded in the last year or two has dropped the over-all recovery rate slightly to 2.4 percent, which is still far higher than comparable recovery ratios in this country. Most of this is apparently due to the high rates for passerines and waders, which of course reflect the heavy hunting pressures these species, protected in North America, are subject to in Europe. On the other hand, while their game bird, waterfowl, and raptor recovery rates are roughly comparable to ours, their dove recoveries at 9 percent, gulls at 7 percent, and terns at 0.8 percent (each 3 to 5 times ours) suggest the reporting of bands that come to human notice is far higher abroad than here. Also of interest is the change in the distribution of foreign recoveries. The change in USSR policies, which since about 1954 have allowed Russians to report foreign bands to their sources, has raised Finland's nearest and largest neighbor from 13th to 7th place in the 45-year totals.—O. L. Austin, Jr.

MIGRATION

(See also numbers 28, 47, 51)

6. Migration Routes of the Arctic Tern. G. M. Storr. 1958. *Emu*, **58**(1): 59-62. To me this title is certainly nostalgic. I used it 30 years ago for my first published paper *(Bull. NEBBA*, 1928: 121-125), in which I postulated the eastern Atlantic flight route southward for both the North American and the European populations of Arctic Terns, a radical thought indeed in those days, for it contradicted the writings of Welles W. Cooke. Though he is the most recent, Storrs is not the first subsequent author to ignore my maiden effort, and my two later contributions to the same subject *(Bull. NEBBA*, 1929: 35-36 and *Birds of Newfoundland Labrador*, 1932: 126) as well. Nevertheless it is gratifying to see one's youthful brainchild accepted, even if not correctly credited, and I hope time will substantiate Storr's theories as it has those of my first venture into print.

Storr speculates here on the probable source of the Arctic Terns in the southern Indian and southwest Pacific Oceans, where recent records show the species is of fairly regular occurrence between October and December. He suggests these birds probably come from the populations migrating down the eastern Atlantic. He points out that these migrants, on leaving the Cape of Good Hope for their wintering grounds at the edge of the antarctic pack ice, must cross the strong westerlies of the "Roaring Forties." These winds could easily carry the birds far to the eastward before they win through them, particularly if they are molting their flight feathers. Such birds may have to fly back out of the westerly belt and remain north of it in southern Australia and New Zealand until they complete their molt.

While the lack of any evidence for it does not rule out completely the possibility of an as yet undiscovered flight route southward across continental Eurasia and the Indian Ocean, Storr's hypothesis is logical and in accord with the available facts. Four Arctics recently collected in Australia were molting, and one was banded in northern Russia (cf. *Bird-Banding*, **29**: 41-42, January, 1958). It does seem strange, however, considering how many more Arctic Terns have been banded in North America than in Europe, that no American bird has as yet been recovered east of southeastern Africa. When more recoveries come in from, let us hope, increased bandings of Arctics on their circumpolar breeding grounds in the northern hemisphere, they may show that the eastern North American and western European populations of *Sterna paradisaea*, despite their sharing the same route southward part of the way, have quite discrete wintering grounds, just as under similar circumstances do the Great Lakes and coastal Atlantic breeding populations of American *Sterna hirundo* (cf. *Bird-Banding*, **24**: 39-55, April, 1953).—O. L. Austin, Jr.

7. Destruction at the TV Tower. Charles A. Kemper. 1958. *Passenger Pigeon*, **20**(1): 3-9. For 4 years Dr. Kemper has been watching for fatalities at the 500-foot television tower at the junction of the Eau Clair and Chippewa Rivers, but found none until last fall after a 1,000-foot tower had been erected. On Aug. 29 some 400-500 birds were killed, on Sept. 3 some 300-400, and on Sept. 20, perhaps 20,000. The author was able to salvage 1,525 individuals of 40 species. He decided that "the extra 500 feet is the big factor in causing these accidents," and suggests: "Perhaps if television towers could be illuminated by flood lights on the ground, severe disaster could be averted."—M. M. Nice.

8. The Migrations of British Hawks (Accipitridae) as Shown by Ringing Results. A. Landsborough Thomson. 1958. *British Birds*, **51**(3): 85-93. The recovery percentages in 5 species of banded hawks range from 5.2 to 15.9. The 1,254 Sparrowhawk *(Accipiter nisus)*, recoveries show that birds native to the British Isles are sedentary. "The oldest bird was nearly eight years of age. There is a heavy mortality in the summer months, which can be related to game-preserving." Birds ringed as full-grown and recovered at a distance are believed to be migrants from other countries; two of these came from S. Norway. Some winter in Great Britain, while others go on to Holland and France.—M. M. Nice.

9. The Migrations of British Falcons (Falconidae) as Shown by Ringing Results. A. Landsborough Thomson. 1958. *British Birds*, **51**(5): 179-

188. From 12 to 15 percent of ringed birds of 3 species were recovered. Results from 155 Peregrines *(Falco peregrinus)* showed a marked tendency in this species to wander up to 150 miles; and from 532 Merlins *(F. columbarius)* ringed as nestlings individuals were recovered in the British Isles in all months of the year, while of 1,982 Kestels *(F. tinnunculus)* many prove to be sedentary, some dispersed as far as 100 miles in their first autumn, and a few migrated south to Belgium, France, and North Spain, while one was found in its second year in Sweden. A Peregrine and a Merlin reached 8 years of age, a Kestrel 11 years.—M. M. Nice.

10. An invasion of Sandwich Terns on the Swedish west-coast 1956. (En invasion av Kentska tärnor *(Sterna sandwicensis)* på Västkusten 1956.) Ingvar Lennerstedt. 1958. *Vår Fågelvärld*, **17**: 28-44. (English summary.) This is a review of the fall migration routes of the Sandwich Tern in relation to weather and wind-drift, undertaken after an influx of about 242 terns took place during July-August 1956. Invasion-like appearances of this tern on the Swedish west-coast have a definite connection with high W and SW winds and originate for the most part from the large breeding colonies on Hirsholmerne in northern Jutland. Banding data confirm this conclusion. Some terns were picked up dead from exhaustion, others were found far inland in a state of shock and starvation, and still others were seen flopping on the grass upon arrival to rest stretched out facing into the wind. Several maps and tables amplify the text. —Louise de K. Lawrence.

11. Ornithological observations in the "Zubring" area (Bulgar-Romanian Black Sea coast) of the Bosphorus migration route. Ornithologische Beobachtungen im "Zubringerraum" (Bulgarisch-Rumänische Schwarzmeerküste) des Bosporuszuges). H. Kumerloeve. 1958. *Bonn. Zool. Beitr.*, **8**(3/4): 248-274. Thermal soarers, especially large raptors and White Storks, pass along this coast, some species in very large numbers. By this route they avoid crossing both the Black Sea and the Mediterranean. Other species such as ducks, shore-birds, and passerines are either terminal migrants in south-eastern Europe or go across the Mediterranean and do not use the Bosphorus route. Some range-finder observations on height of flight are given (up to 3100 m.). It is estimated that *Grus grus* may be visible as far as 4,000 m.—C. H. Blake.

12. New observations on the Fall migration in the passes of Cou and Bretolet. (Nouvelles observations sur la migration d'automne aux cols de Cou et de Bretolet.) Michel Godel. 1957. *Nos Oiseaux*, **24**: 59-75. Another report covering the results of a *Nos Oiseaux* Youth Group study (See No. 17). This project consisted of banding migrants in Bretolet Pass in the Alps. In two seasons, 1,675 birds of 51 species were banded, with 9 recoveries up to March 1957. Nets were used in the banding work. An excellent report.—R. O. Bender.

13. Autumn Observations on the Bosphorus and Dardanelles. I. C. T. Nisbet and T. C. Smout. 1957. *Ibis*, **99**(3): 483-499. Notes and comments on the migration across the Turkish "land bridge" as observed by the authors in September 1956, and a discussion of the apparent changes over the centuries in the abundance of certain migrant species, mostly birds of prey.—O. L. Austin, Jr.

14. Autumn Migration in Southwest Portugal. R. E. Moreau and J. F. Monk. 1957. *Ibis*, **99**(3): 500-508. The author's observations in coastal Portugal in late September 1956 raise a number of interesting problems but answer none of them. Apparently the region is traversed regularly by large numbers of night-migrating passerines of species that winter only south of the Sahara, but very few accurate data are available on their movements. "Evidence was obtained that migrants are fewest with east winds," though one would expect easterlies to band the migrants up along the west coast just as westerlies do on the eastern coast of North America. "Most of the birds seen must have been travelling in a south-westerly direction for a long way and it is necessary for their survival that they should change course on reaching the shores of the Atlantic." This they apparently do, but the evidence to date is purely speculative and circumstantial. —O. L. Austin, Jr.

15. The Interstitial and Spermatogenetic Tissue of Autumn Migrants in Southern England. B. Lofts and A. J. Marshall. 1957. *Ibis*, **99**(4): 621-627. Histological study of southbound migrants killed at a Channel lighthouse showed the interstitium of adults "in the process of post-nuptial rehabilitation (involving cholesterol production) even though they were flying away from the traditional breeding ground," while only 6 of 11 juvenals of 7 species "possessed an interstitium in which cholesterol had already developed." The authors also discuss the physiological basis for the production of fat in migrants, both southbound and northbound, and suggest that some of this fat may provide metabolic water as well as energy during flight.—O. L. Austin, Jr.

POPULATION DYNAMICS

(See also numbers 20, 35, 67, 69)

16. The Survival of White-fronted Geese (*Anser albifrons flavirostris* Dalgety & Scott) Ringed in Greenland. Hugh Boyd. 1958. *Dansk Ornithologisk Forenings Tidsskrift*, **52**(1): 1-8. Analysis of the 171 recoveries received by 1956 from the 649 *Anser albifrons* banded in the northwestern Greenland breeding grounds in 1946-1950 shows first year mortality to be about 46 percent, second year 43 percent, and in mature birds 34 percent. These are all slightly higher than corresponding estimates for the mortality in other British-wintering gray goose populations.—O. L. Austin, Jr.

NIDIFICATION AND REPRODUCTION

(See also numbers 26, 35, 69)

17. Complete new examination of the Purple Heron of Switzerland. (Nouvelle vue d'ensemble sur le Héron pourprè en Suisse.) Francois Manuel. 1957. *Nos Oiseaux* 24: 35-59. This paper reports the results of one of the projects of the *Nos Oiseaux* Youth Group which celebrated its tenth anniversary by contributing this and a paper on migration studies (See No. 12) to the journal. The Youth Group accepts members who are 12 to 24 years old. They are supported by special funds collected by and administered through *Nos Oiseaux* and used to further their studies. If this paper is typical of the results of their work, it is surprisingly comprehensive, mature, and perceptive of the fine points of ornithology. Although the paper itself does not contain much information of general biological interest, it is filled with excellent details regarding the life history of this species. Occasional notes by the editor contribute tactful suggestions that perhaps other explanations than those presented are available to explain some of the data. The average clutch size of 154 nests was 4.16 with a range of 2-6. Duration of incubation was from 25-30 days. During 15 years, 366 young were banded, mostly in 6 of the last 8 years; from these 37 recoveries have been reported, 32.44 percent of these during the first September after banding. Twenty of the birds were shot by hunters or fishermen, 10 were found dead, 3 flew into high tension wires, 2 fell from the nest, 1 was captured alive and 1 band was recovered without the bird. The bird found alive was picked up on 14 June 1954 about a kilometer from its nesting colony but was unable to fly. Another excellent paper.—R. O. Bender.

18. Habitat selection and breeding of the Black-headed Gull. (Biotop och häckning hos skrattmåsen *(Larus ridibundus).)* Gunnar Svärdson. 1958. *Vår Fågelvärld*, *17*:1-23. (English summary.) This study was conducted on a small island in Lake Mälaren for 8 years. The gull colony was established there 4 years before the author began his investigations. A combination of several factors, an untimely cold spell, the predations of Tawny Owls *(Strix aluco)*, and an influx of voles because of the miscarriage of an experimental arrangement of the habitat, caused them to move away 12 years later.

The selection of the colony site rests upon five requirements: 1) the proximity of water, 2) dry nest foundations, 3) unimpaired view in all directions. 4) protection by water against mammalian predators, 5) absence of trees. However, individual experience may modify these requirements to some extent in either a positive or negative way. For instance, the memory of danger may cause the gulls not to repeat nesting in a place that was once unsafe. Faithfulness to a previously occupied nest-site (Ortstreue) plays an important role in site selection. Older birds show far greater reluctance to relinquish a locality where

they have nested before than younger ones whose shorter experience has not yet had time to forge a strong bond between them and a certain site. Therefore the old birds act as the "anchor" of the colony. The younger generations may show unrest for various reasons and leave, but this does not affect the old-timers. They hold the colony fast to a certain place provided sufficient cause does not arise to drive them away. In that case, they draw all the others of the colony with them, regardless of whether these others have been exposed to the stimulus to quit or not.

The clutch consists of 1-4 eggs. The old gulls lay larger clutches than the younger ones. Their greater aggressiveness and earlier arrival, giving them the advantage of choosing the best nest-sites, have the effect of prolonging their courtship and egg-laying stages. Thus the start of incubation is delayed, permitting the laying of more eggs before broodiness sets in with its deteriorating influence upon the "reserve-egg" formation within the ovary. In the younger gulls, on the other hand, the preliminary phases of their courtship and egg-laying are held back by their enforced occupation of second-choice sites of lower quality. This causes a "hormonal pressure" to arise, which in turn constricts the egg-laying period so that the start of incubation follows quickly upon the laying of the first eggs with ensuing deterioration of the other ova. The average incubation period is 23 days.

These are only a few highlights picked from this fine paper, which is well summarized in an adequate English abstract for the interested student.—Louise de K. Lawrence.

19. Incubation Period in the Pheasant. Kaj Westerskov. 1958. *Emu*, ***58*** (2): 139-151. "Under wild conditions the hen Pheasant of the Ringneck [*Phasianus colchicus torquatu*] and Blackneck [*P.c.colchicus*] subspecies will hatch her clutch within 23½ days; frequent interruptions of the sitting hen may prolong the period up to 25 days or even longer. Eggs incubated in artificial incubators with no interruptions . . . may hatch in 22 days. If eggs are addled a hen Pheasant may sit for 47 days or longer." Most interesting is the discovery that "Eggs of the Mongolian Pheasant *(P.c.mongolicus)* have a longer incubation period than eggs of the Ringneck and Blackneck Pheasants and crosses between them. Mongolian eggs hatch in 24-25 days, about 24 hours later than the two other subspecies." Westerskov reasons that this must be caused by differences in the rate of development of the embryo, but whether this in turn results from different rates of cell division or differences in cell sizes remains to be determined by future investigation.—O. L. Austin, Jr.

20. The Behavior, Breeding, and Food-Ecology of the Snowy Owl, *Nyctea scandiaca*. Adam Watson. 1957. *Ibis*, **99**(33): 419-462. This important study is based on the author's field work in east Baffin Island during the summer of 1953, supplemented by observations on a pair of Snowy Owls that bred in a London zoo in 1955. Amply detailed, it contains much valuable first-hand information on the summer behavior and ecology of this not easily studied species. Most interesting are the findings on survival of the young. The summer of 1953 was a population peak in the lemming cycle, and the owls fed on them almost exclusively. The abundance of food and the long arctic daylight that allows more time for feeding, the author feels, were primarily responsible for the phenomenal nesting success: of 32 eggs laid in the 8 nests under observation, 31 hatched and all hatched were fledged. Not only was the growth rate of the young markedly higher than in any other predator for which comparable figures are available, the well-fed young were able to resist the effects of cold wet weather during the critical stages of their growth, the main cause of mortalities reported elsewhere. There are also salient comments, backed by figures, on the negligible effects of the owls' predation on the lemming population, and on the relations between prey abundance and predator distribution.—O. L. Austin, Jr.

21. Breeding of the Snowy Owl in southeastern Baffin Island. George M. Sutton and David F. Parmelee. 1956. *Condor*, **58**(4): 273-282, 3 fig. This necessarily rather incomplete account of 11 nests does not permit very firm conclusions. The clutch may contain as many as 10 eggs. Laying begins in the first half of May. The eggs hatch at about 2-day intervals. With an apparent mean clutch size of 6½, about one egg per clutch fails to hatch and about four young are fledged. The food was wholly lemmings, *Dicrostonyx groenlandicus* and *Lemmus trimucronatus*.—C. H. Blake.

22. On the Breeding Biology of the Guillemot *(Uria aalge (Pont.)).* Arne Nørrevang. 1958. *Dansk Ornithologisk Forenings Tidsskrift,* **52**(1): 48-74. In English with a Danish summary and eight fine photographs, the author describes the nesting activities of Common Murres as he observed them over a 10-week period on a ledge in the Faroe Islands. Ethologists will doubtless find much of interest and significance in his detailed findings.—O. L. Austin, Jr.

BEHAVIOR

(See also numbers 20, 22, 40, 44, 69)

23. "Imprinting" in Animals. Eckhard H. Hess. 1958. *Scientific American,* **198**(3): 81-90. A fine summary, illustrated with graphs and sketches, for the nonspecialist of the author's carefully controlled, ingenious experiments on imprinting ducklings. Mallard ducklings of known ages were imprinted to mechanically-moved models of male Mallards that contained tape-recordings of a human rendition of *gock gock gock.* The critical period for imprinting proved to be 16-17 hours after hatching. (An attempt to imprint the ducklings to different sounds while still in the egg was unsuccessful.) Ducklings 12-17 hours of age were exposed to the model for 10 minutes with the model moving at different speeds, so the subjects followed for 12½, 25, 50, and 100 feet; "at distances up to 50 feet the strength of imprinting increased with the distance traveled." Ducklings that had to climb 4-inch hurdles while they followed the model were more strongly imprinted than were controls. "The strength of imprinting appeared to be dependent not on the duration of the imprinting period but on the effort exerted by the duckling."

It has been suggested that imprinting may be nullified by the fear of moving objects that normally appears in ducklings at about 20 hours of age. To test this Dr. Hess administered meprobomate to eliminate fear, but this procedure reduced imprintability. The author suggests that "in the imprinting process some degree of anxiety is necessary"; this "may merely be the fear of being left alone." (For the scientific report on this experiment see *Annals of the New York Academy of Science,* **67**: 724-732. 1957.)—M. M. Nice.

24. Avian mobbing behavior and predator recognition. Stuart A. Altmann. 1956. *Condor,* **58**(4): 241-253. Mobbing of a predator differs according to the species of mobber, the species of predator, and the presence or absence of other species of mobbers. The author tested reactions toward specimens of several western owls. Various precautions were taken, including avoidance of nesting territories of the "prey" species. Some birds (Brown Towhee) show almost no reaction even when a specimen is being mobbed. Others (Wren-tit) stay in cover giving a particular call. At the other extreme the adult male Redwinged Blackbird may claw feathers from the head of the specimen. Some differences are related to age and sex and others may be purely individual in the mobbing species. Some species seem to be only secondary mobbers. In California and Nevada the maximum mobbing occurs in spring and there is a long minimum in summer and fall.

The author sets up a series of relations between prey and predator depending on the spatial relation between the ranges of the two species and of the prey individual and indicates these relations for a number of species in a table of reactions. He finds sufficient data to conclude that mobbing behavior is probably innate in Audubon's Warbler.

Obviously various questions are unanswered. When mobbing both of museum specimens with glass eyes and study skins with cotton eyes occurs, what are the cues that mean "owl"? What would the reactions be to a specimen that is moved slightly at brief intervals? Are predator species recognized as such? No clear-cut data were obtained but there are affirmative hints in the table. There is much further work to be done on mobbing.—C. H. Blake.

25. Behavior and Ecology of Young Velvet Scoters and Their Mothers. (Verhalten und Ökologie der Jungen und der Jungenführenden Weibchen der Samtente.) Jukka Koskimies. 1957. *Annales Zoologici Societatis Zoologicae Botanicae Fennicae* "Vanamo," **18**(9): 1-69. A detailed study of the maladjustment of *Melanitta fusca* to a maritime environment. (For a brief statement in

English see *Acta Xi Congressus Internalis Ornithologici:* 1954: 476-479.) The Velvet Scoter originally nested inland on small ponds, but in the past 25 years has colonized the outermost archipelago off the south coast of Finland. The comparatively weak mother-young bond, suitable in the original environment, results in very high mortality of the ducklings under the new conditions of lack of limits to wandering, to cold water, and to heavy predation by Lesser Blackbacked Gulls *(Larus fuscus).* A lost duckling cannot stop to dive for food or preen or rest; it constantly swims about uttering distress notes. It tries to join a brood but is often repulsed by the mother, but even if it can join another orphan its "social hunger" is largely satisfied and the two behave more normally.—M. M. Nice.

26. Great Blue Heron: Behavior at the Nest. W. P. Cottrille and Betty D. Cottrille. 1958. *Miscellaneous Publications, Museum of Zoology, University of Michigan,* No. 102: 1-15. $0.35. Observations in a colony of *Ardea herodias* in southern Michigan, primarily to study courtship and to compare the behavior of our bird with that of the European Heron *(A. cinerea).* A "striking similarity" was found. The detailed descriptions are illustrated by 21 remarkably fine sketches by Richard P. Grossenheider.—M. M. Nice.

27. The Daily Activity of Titmice of the Genera *Parus* and *Aegithalos.* *(Movements outside the Breeding Season.)* (Zur Kenntnis der Tagesaktivität von Meisen der Gattungen *Parus* und *Aegithalos.* (Raumaktivität ausserhalb der Fortpflanzungszeit.) Jiří Felix. 1958. *Sylvia,* **15**: 5-21. (In Czech with German summary.) Banded Great, Blue, and Crested Tits *(Parus major, cæruleus,* and *cristatus)* and Long-tailed Tits *(Aegithalos caudatus)* were watched for 2 seasons near Prague. Seven maps plot the courses of individuals and flocks. From 16 July 1952 to 23 Jan. 1953 a flock of 48 Long-tailed Tits was reduced to 13 survivors, mortality being largely due to hawks and owls. During 2 days a Blue Tit traveled 1,700-1,800 meters per day, over an area of 4 to 7 hectares, moving at the rate of 210 to 225 meters per hour. A mixed flock traveled 3,000 meters in a day, averaging 400 meters per hour. On an average the titmice spent 80 percent of their waking time in the search for food, 5 percent in preening, 5 percent in resting, and 10 percent in other activities, bathing, preparing for rest, etc.—M. M. Nice.

28. On The Life History of the Great Crested Grebe. (Zur Kenntnis der Lebensweise des Haubentauchers *(Podiceps cristatus).* Emil M. Hachler. 1958. *Sylvia,* **15**: 77-83. (In Czech with German summary.) Migration dates for 25 years for South Moravia. During the first few days the chicks stay on the female's back where they are fed by the male. From the first day the male makes them swallow feathers that have been soaked in water.—M. M. Nice.

29. The Postembryonic Development of the Water Rail. (Die Postembryonale Entwicklung der Wasserralle *(Rallus aquaticus).* Leo Sigmund. 1958. *Sylvia,* **15**: 85-118. (In Czech with German summary.) Detailed observations on growth and pterylosis of 9 hand-raised chicks, summarized and illustrated in 5 tables, 13 graphs, and 7 photographs. Interesting notes are given on behavior including description of 5 different vocalizations. Hostility between brood members was first recorded at the age of 34 days.—M. M. Nice.

30. Observations and Experiments Conducted on a Tame Blue Tit *(Parus caeruleus L.).* Mogens Højgaard. 1958. *Dansk Ornithologisk Forenings Tidsskrift,* **52**(1): 1-8. A hand-reared young Blue Tit "appeared completely to lack instinctive fear of natural enemies. It did not react to dogs or cats, but continued, for example, with its meal while a cat sat immediately in front of its cage watching it. Neither did the bird manifest fear of dummy birds of prey, nor of a stuffed Buzzard and Sparrow-Hawk. . . . The bird's reflection in a mirror and a stuffed Blue Tit did not elicit any reaction of importance, although attempts at copulation on human hands were often observed. . . . Some experiments concerning the bird's ability to discriminate between form and number were carried out, and the results are presented graphically. The bird learned quickly compared to birds examined by other authors possibly because nothing in the experimental setup could arouse its "mistrust" or frighten it. Neither was it distracted, as it would have been, for example, if others of its species had been present."—O. L. Austin, Jr.

ECOLOGY

(See also numbers 18, 25, 37, 49)

31. The correlation between the fluctuations of partridge and European hare populations and the climatic conditions of winters in Southwest Finland during the last thirty years. Lauri Siivonen. 1956. *Papers on Game Research,* Finnish Game Foundation **17**: 1-30 The Finns have developed a system of observers who can produce satisfactory relative figures for the abundance of game each year. On these figures as a base Siivonen considers the relation between relative abundance and the temperature and snow depths of the preceding winter. For *Perdix perdix* the most important factor is average snow depth for the months November to April. The population declines if it exceeds 15 cm. and increases with less snow. He makes the interesting point that the magnitude of the population change is part of a general short-term fluctuation which is governed by other factors while winter conditions determine the timing of the fluctuation. He also shows that partridges have actually moved north out of southwest Finland in some years when the snow conditions northward were much more favorable.

The population changes of *Lepus europaeus* have generally paralleled those of partridge, but the species is a little less sensitive to snow depth and did not migrate north in the early 1940's. Records of the weights of both partridge and hares found dead in the winter indicate starvation as the major cause of death.

The Institute of Game Research has, since 1949, caused consistent observations to be made on the population of Goldcrests *(Regulus regulus).* A minimum winter temperature of —30°C (—22°F) appears to mark the dividing line between increased and decreased populations the following summer. The Institute evidently does not regard game animals as being a law unto themselves.

In this series of papers "to hibernate" is used to mean "to winter," etymologically justified but not in accord with English usage.—C. H. Blake.

32. Avifaunistic and Ecological Conditions of the Peat Bog Region Between the Danube and the Tisza. L. Horváth. 1958. *Acta Zoologica Academiae Scientiarum Hungaricae,* **3**(3-4): 233-244. From 1952-56 the author carried on surveys of the bird life in the rapidly changing region between the Danube and the Tisza. The 153 species recorded, 89 of which bred, are listed according to 6 habitats: reedy lakes, marshy meadows, alkaline lands, dry steppes (puszta), boggy woodland, territories under cultivation and settlements. Mr. Horváth recommends measures for increasing the populations of economically useful birds, as making fishpond nesting sites for Black-headed Gulls *(Larus ridibundus)* and planting acacia groves on the dry meadows for Red-footed Falcons *(Falco vespertinus).*—M. M. Nice.

33. The Bird Succession in the Conifer Plantations on Mat-grass Land in Slovakia (CSR). F. J. Turcek. 1957. *Ibis,* **99**(4): 587-593. A statistical study of the change in the avifauna with time in bare pasture lands planted to conifers, based on observations of species composition, numbers of individuals, and biomass per hectare. "The change from pasture to forest occurs about six to ten years after planting. The last forest birds come in about 20 years after planting. . . . Throughout the entire successional series the bird population seems to have a kernel of species, while other species come or go and/or change in density with the stages."—O. L. Austin, Jr.

WILDLIFE MANAGEMENT

(See also numbers 19, 31, 32, 38, 46, 52, 53, 54, 59, 60, 67)

34. A Guide to Prairie Chicken Management. F. N. Hamerstrom, Jr., Oswald E. Mattson and Frances Hamerstrom. 1957. *Technical Wildlife Bulletin* Number 15. Game Management Division; Wisconsin Conservation Department. 128 pp. Based on years of intensive study of *Tympanuchus cupido pinnatus,* this clear-cut, intensely practical and convincing report is a masterly piece of work. Part I—Past and Present Distribution of the Prairie Chicken in Wisconsin—is dramatically portrayed in six maps. In Part II—Habitat Management —we read that "Grassland is of vital importance to prairie chickens, the keystone

to prairie chicken ecology." Requirements are discussed for nesting and rearing grounds, booming grounds, winter feed, and winter cover. As to Part III—Population Management—we learn:

"(1) Hunting must be restricted to the harvest of surplus birds, when available. (2) Competition with exotic species having similar habitat requirements should be held to a minimum on all areas managed for prairie chickens. (3) Control of predators is less important than the provision of strong habitat. (4) The spread of diseases and parasites can be discouraged by dispersing, rather than concentrating, winter food supplies. (5) Strong habitat is the best and only practicable defense against extremes of weather."

More technical aspects of management are discussed in three appendices. There are many photographs in this report, as well as maps, graphs, and six pages of references.

"In conclusion, the prairie chicken *can* be saved in Wisconsin—*but only if action is taken now.*"—M. M. Nice.

35. Productivity of New Zealand Pheasant Populations. Kaj Westerkov. 1956. *New Zealand Department of Internal Affairs, Wildlife Publication* No. 40B; 1-144. In Europe and North America the average clutch size of *Phasianus colchicus* is 12; in New Zealand it is 9. The population is sparse and breeding extends over 9 months in the year. Westerkov considers the 42 percent hatching in 208 nests studied a "very low proportion"; nevertheless he quotes Buss et al (1951) as reporting the over-all average hatching success in 5,611 pheasant nests in 18 North American studies as 34 percent. In New Zealand of the 8 chicks that hatch only 3 or 4 are still alive at 12 weeks of age when dispersal ordinarily takes place. The greatest loss of eggs and hens comes through mowing, but burning of the scrub also destroys many nests. "Between 60 and 70 percent of the autumn population are young birds of the year. The population turnover period is five years, possibly highest in hens." This informative report is well organized and well documented; it contains a detailed table of contents, 45 tables, 18 graphs, a summary, a 5½-page bibliography and an index.—M. M. Nice.

36. Troubles from feral Rock Doves. (Plagen durch verwilderte Haustauben.) Edith Döhring. 1958. *Ornithologische Mitteilungen*, **10:** 41-46. This paper reviews the annoyances caused by feral Rock Doves *(Columba livia)* living in cities in close proximity to man and the control measures tried to date. Although the virus causing ornithosis in man has been found in Rock Doves in many countries, no case has been reported in which man has contracted the disease from Rock Doves.—R. O. Bender.

37. Experiments in raising the breeding density of birds in oak and part oak forests. (Versuche zur Steigerung der Siedlungsdichte der Vögel in Eichen- und Eichenmischwäldern). Herbert Bruns. 1956. *Waldhygiene* **1**(7): 220-226. This continues work already reported in *Ornith. Mitt.* **7:** 221-227 (1955—see *Bird-Banding*, **28:** 104-105). Great increases in the number of broods produced were obtained by providing nest sites although the limit seemed to be reached at about 44 sites per hectare. The results are complicated by the use of several types of nest boxes with quite different rates of utilization. The author points out that experimental areas of 1-2 hectare are too small, particularly if it is desired to demonstrate control of some pest such as oak tortrix in a large forest.—C. H. Blake.

CONSERVATION

(See also numbers 7, 48, 67, 68)

38. Birds and Aircraft on Midway Islands. 1956/57 Investigations. Karl W. Kenyon, Dale W. Rice, Chandler S. Robbins, and John W. Aldrich. 1958. Special Scientific Report—Wildlife No. 38, U. S. Fish and Wildlife Service. 51 pp. Aircraft striking birds at Midway have sustained minor damage, but the hazard is considered more serious for jet planes. Earlier attempts to control the hazard met with little success, and indicated the need for a more extensive study of the principal species involved, the Black-footed and Laysan Albatrosses and the Sooty Tern.

Results to date indicate that the problem is limited in general to the Laysan Albatrosses, that nonbreeding birds contribute to the runway hazards about five times as much as their numbers alone would indicate, and that the most effective control may be the flattening of dunes and tall vegetation near runways to reduce the updrafts the birds use for soaring.

The killing of some 6,200 albatrosses in a control experiment during these investigations and of roughly 7,000 others in the area by construction work and other acts of man between November and May has caused some concern to conservationists. However, this should be compared with populations of about 236,000 Laysan and 16,000 Black-footed Albatrosses on the two islands in the Midway group. Also, any concept of the airfield and other works of man purely as intruders upon an existing major albatross colony is unrealistic. On Sand Island, which has the principal airfield and settlement, the Laysan Albatross population has increased from almost nothing in 1891 to some 59,000 nesting pairs, aided in three ways by human use of the island: (1) trees and shrubs offer protection from wind and blowing sand; (2) open ground interspersed with these makes ideal nesting sites; and (3) roads afford unobstructed avenues for albatross landings and take-offs, and for walking or running between the sea and nests. Green Island (Kure Atoll, only 56 miles west of Midway) has very similar conditions except that it lacks Midway's human activities, and it supports only some 500 pairs of the two albatrosses.—E. Alexander Bergstrom.

39. Artificial ponds and small lakes. (Konstgjorda gölar och småsjöar.) C. A. Frändén. 1958. *Vår Fågelvärd*, **17**: 24-27. Whatever is said or done about the preservation of natural life in our habitat-destructive age, I believe important enough to report. This is a discussion directed to all who think along the lines of preservation of habitable environment and how and where to create "oases" of nature in the landscape of "culture," telling in vivid language of how greedily multitudes of plants and creatures occupy every newly created pond and small lake and how enriching these are not only to the face of the landscape and to wildlife but also to man himself. The problem of indiscriminate drainage and deforestation is indeed as pressing on this continent as it is in Sweden.—Louise de K. Lawrence.

PHYSIOLOGY AND PSYCHOLOGY

(See also numbers 15, 30, 61)

40. The Chick's "Preference" for some Visual Properties of Water. Harriet L. Rheingold and Eckhard H. Hess. 1957. *Journal of Comparative and Physiological Physiology*, **50**(5): 417-421. White Rock chicks, 3 days old, having had no experience of food or water, were given a choice of 6 substances: the order of preference was mercury, plastic, blue water, water, metal, and red water. Four days later they were re-tested and again mercury was first choice and water fourth. Control chicks that had had access to food and water as soon as they left the incubator also preferred mercury when tested at 3 and 7 days of age. Mercury seemed to be a supernormal stimulus. (No chick ever succeeded in swallowing it for it fell from the beak.) The attractiveness to the chick of these different substances seemed to lie in a combination of a bright reflecting surface and movement. The authors suggest that "we are dealing with an innate reaction, a built-in 'preference' which is not modified by experience, at least during the first seven days of the chick's life."—M. M. Nice.

41. Natural Preferences of Chicks and Ducklings for Objects of Different Colors. Eckhard H. Hess. 1956. *Psychological Reports*, **2**: 477-483. One hundred day-old White Pekin ducklings and 200 White Rock chicks were tested as to innate color preference by being placed in an octagonal apparatus on the sides of which were 24 Ostwald color chips. The ducklings marched around the periphery of the box, pecking at the stimuli as they passed, while the chicks clustered in groups about a particular color. Each peck was recorded automatically; the ducklings delivered 124,242 pecks, the chicks 127,504. The ducklings showed "a single sharp peak within the green and yellowish-green region," while the chicks showed a bimodal preference, with one peak in the orange region, the other in the blue. These tests were done in May; later experiments indicate a seasonal variation.—M. M. Nice.

MORPHOLOGY AND ANATOMY
(See also number 15)

42. Sex and age characters and salivary glands of the Chimney Swift. David W. Johnston. 1958. *Condor*, **60**(2): 73-84. Most of the 75 specimens of *Chaetura pelagica* studied were taken in southern Georgia. In agreement with previous authors, adult females average lighter in weight (23.4 g vs. 24.0 g) than males, but the difference is not statistically significant and all adults weigh less in midsummer than in either spring or fall. The postnuptial molt is a long process, possibly requiring 3½ months or more. It begins with the first primary early in June, and by mid-July the secondaries and body feathers have begun to molt. The process ends with the tail and the outer primary. The immatures do not show significant molt after leaving the nest. When does the postjuvenal molt occur? Hence, a molting bird, at least up to mid-September when some have completed the molt, is an adult. The skull does not ossify completely although only two or three small "windows" remain in the adult. Maximum gonadal activity is about 1 June. The testes are almost completely regressed by mid-July.

Johnston points out that it is not possible to say that all swifts have enlarged salivary glands in the breeding season. The evidence is against the use of saliva in nest building by *Streptoprocne* and *Cypseloides*. There is no evidence for the use of saliva by swallows, and the author implies that they may not have salivary glands. Those of swifts are sublingual glands placed just under the ventral oral epithelium. It should not be too difficult to find them in other birds, if present. In the Chimney Swift the glands increase in weight during the second half of May from about 5 mg/gland to about 60 mg. Aside from more rapid enlargement, the pattern of change is nearly the same as in the gonads. The general histology of the glands in various states is described. The salivary glands may well be under the control of the same endocrines as are the gonads. —C. H. Blake.

43. Casts of the Pulmonary System of Birds. D. H. Tompsett. 1957. *Ibis*, **99**(4): 614-620. Describes a "reliable" technique of making casts of the avian pulmonary system in transparent synthetic resin with "only simple and inexpensive apparatus." For good results the subject has to be "healthy and free from structural damage. A shot bird . . . is useless as the air sacs are certain to be punctured. . . . The bird must be killed the day before the resin is injected, to allow time for it to cool to room temperature, and for rigor mortis to terminate." The technique from this point on strikes me as anything but simple: The bird is placed in a vacuum chamber while the air is removed from its lungs, and must be kept under negative pressure until injected; the resin must be prepared at just the right viscosity; after injection the bird has to be immersed in water for 8 days while the resin hardens, and then put in an acid bath for 5 more days to remove the tissues around the cast. Nevertheless such casts should greatly facilitate anatomical study of the lungs, air sacs, and bronchial system, which have been described adequately only in such domesticated species as the fowl, duck, and pigeon.—O. L. Austin, Jr.

44. On the Morphology of the Bursa Fabricii of Birds. (Beitrag zur Morphologie der Bursa Fabricii der Vögel.) Milan Klima. 1958. *Sylvia*, **15**: 151-170. (In Czech with German summary.) Researches on 409 individuals of 35 species, abundantly illustrated with sketches and photographs.—M. M. Nice.

PLUMAGES AND MOLTS
(See also numbers 31, 42, 57)

45. The Distribution of Structural Colours and Unusual Pigments in the Class Aves. L. Auber. 1957. *Ibis*, **99**(3): 463-476. Feather colors are of two main types, (1) from pigments in the feathers and (2) from feather structures that refract or reflect light. This paper deals mainly with the latter type, which produces bright colors in feathers by two main optical principles: (1) interference of light in the thin laminae of the barbules, which cause the metallic or iridescent colors, and (2) the so-called "Tyndall effect" of scattering, largely by the barbs of the feathers, which produces most of the noniridescent blues, greens, and purples. A survey of the occurrence of these two structural types of colors in various avian families shows that with few exceptions they do not

occur together. Their mutual "'incompatibility' . . . appears to be based on a certain evolutionary antagonism between barbs and barbules . . . which must be reflected in the histogenesis of different types of contour feathers." Auber suggests that as the barbules are formed from the feather germ tissue before the barbs are, "extreme differences between the relative rates of cell-division (and possibly of increase in cell-volume) may determine production of a feather with either (a) thin barbs and broad barbules (iridescent type), or (b) voluminous barbs, usually with relatively thin and short barbules (Tyndall-coloured type)." —O. L. Austin, Jr.

46. On the Growth and Molt of our Phasianidae. (Zur Kenntnis des Wachstums und Mauserverlaufs unserer Phasianiden.) Jaroslav Figala. 1958. *Sylvia*, **15**: 119-149. (Czech with German summary.) Detailed observations on 34 hand-reared Pheasants *(Phasianus colchicus)*, Partridges *(Perdix perdix)* and Quail *(Coturnix coturnix)*, results being given in 14 graphs and 3 tables. Particular attention is given to the attainment of flight.—M. M. Nice.

ZOOGEOGRAPHY

(See also numbers 32, 33, 55)

47. Distribution and migration of races of the Mourning Dove. John W. Aldrich and Allen J. Duvall. 1958. *Condor*, **60**(2): 108-128, 3 fig. As a species *Zenaidura macroura* has an enormous range, is ecologically quite tolerant, and shows considerable variability within its local populations There is also evidence that some individuals go far out of their normal range during migration. (See *Bird-Banding* **29**: 42.) The authors assembled 204 presumably breeding specimens from the entire range of the species, however tropical America was represented by only about 26 specimens.

The trends, which appear to be independent of age and sex, are: dark to pale from east to west; browner to grayer from south to north in the United States (considered a "color phase"); wing length decreasing with latitude; bill length increasing and middle toe length decreasing westward on the continent. Males have significantly longer wing, middle toe, and tarsus than have females.

Five races are recognized:

1. *carolinensis*—long-winged, dark; eastern U. S. and southern Ontario.
2. *marginella*—long-winged, pale; southwestern Canada to temperate Mexico.
3. *turturilla*—short-winged, pale, short-legged, long-billed; Panama and perhaps elsewhere in Central America.
4. *macroura*—short-winged, dark or medium in color, deep buff-bellied; West Indies and Florida Keys.
5. *clarionensis*—very dark brownish, large-footed, long-billed; Clarión Island.

The breeding distribution of these races is mapped, but Jamaica and Puerto Rico are omitted although there is little doubt that *Z. m. macroura* breeds on both islands. The map must be read with some care. A magnifying glass is needed to identify spots marking specimens of a race outside its normal distribution. On a check of some states I was not able to make the spots marking specimens agree with the number of localities affording presumed breeding birds as recorded in the list of specimens.

The most reliable sex characters are the duller, more brownish and less vinaceous underparts of females and the relatively bright blue-gray tint of the dark areas on occiput and hindneck of males.

Although intergrades between *carolinensis* and *marginella* are known, neither of these appears to intergrade with the tropical races. On its face this implies a complete ecological separation, but it may also be accounted for by the lack of breeding specimens from the critical areas. The present treatment seems reasonably conservative. It certainly suggests the need of banding many more adult doves on the breeding areas to clear the still confused picture of the migration of the two northern races.—C. H. Blake.

48. A Contribution to the Ornithology of the Tristan Da Cunha Group. H. F. I. Elliott. 1957. *Ibis*, **99**(4): 545-586. The author's residence at Tristan from January 1950 to October 1952 gave him the best opportunity for field work on these lonesome, faraway isles ever enjoyed by an ornithologist. Based on his experiences, study and comparison of the specimens he collected with the Tristan material in British and American museums, and a review of the

literature (bibliography of 32 titles), he presents here an up-to-date check-list together with his field and taxonomic notes. His list contains 60 species and subspecies, 32 of which breed there, 7 are "frequent visitors," 10 are "rare vagrants," 9 are hypothetical "unconfirmed vagrants," and only 2 are extinct. "On the whole there has been a tendency among authors to exaggerate the devastating effect of man's activities in the islands: the fact is that after a century and a half of settlement, only two forms, both subspecies of birds which survive elsewhere in the group, are known to be extinct. . . . In both cases their disappearance is . . . likely to have been due to rats and feral cats and so only indirectly to man. There have of course been marked decreases in several of the species of sea-birds exploited, but against this the Great Shearwater *Puffinus gravis*, of which more are taken annually than of any other species, has certainly increased its range and probably its numbers during the past fifty years." —O. L. Austin, Jr.

49. The Breeding Birds of the Huleh Swamp and Lake (Northern Israel). Amotz Zahavi. 1957. *Ibis*, **99**(4): 600-607. Describes the original terrain, vegetation, and bird fauna of the large swamp-surrounded lake at the head of the Jordan Valley which since 1953 has been undergoing drainage and reclamation for agriculture. "Only a reserve of 400 hectares now retains its former features, the water-level there being maintained by dams around it. . . . In a few years the avifauna of the former lake and swamp area will be found only in the reserve and the many fishponds scattered in the valley." Thirty species now breed there (8 of these are recorded nesting for the first time), and only 4 that formerly nested there no longer do so. For the 30 breeding species the paper gives data on the distribution in Israel, laying season, nest site and clutch size. The author adds further proof of the specificity of the two Great Reed Warblers, *Acrocephalus arundinaceus* and *A. stentoreus*, long regarded as conspecific, and gives interesting notes on habitat selection by the local sylviids. Papers such as this on areas rapidly being developed by the exploding human population will be of great value in later years.—O. L. Austin, Jr.

50. Avifauna of the Sierra Nevada, southern Spain. (Zur Vogelwelt der Sierra Nevada.) Günther Niethammer. 1958. Bonn. Zool. Beitr. **8**(3/4): 230-247. The high mountains of south Europe are interesting because: (1) they are largely undisturbed by man above 2,000 m., (2) they are refugia for central European birds that avoid the adjacent hot lowlands, and (3) they are often the southern limit of north and middle European birds which have here produced local races.

Of six alpine birds found in the Pyrenees but one *(Prunella collaris)* reaches the Sierra Neveda where it occurs only above 2,500 m. In all 44 species occur above 2,000 m., as shown on a graph. In south Europe the upper limit of altitude not only rises from N to S but also from E to W.

The taxonomy of a number of species is discussed. Two local light-colored races are found *(Alauda arvensis sierrae, Oenanthe oenanthe nivea)*.—C. M. Blake.

51. On the Cormorants of Kalmarsund. (Om skarvarna *(Phalacrocorax carbo sinensis)* i Kalmarsund.) Torsten Berglund. 1958. *Vår Fågelvärld*, **17**: 44-49. (English summary.) These observations were made at the only existing colony in Sweden. It became established in the 1940s after the species had been absent for more than a hundred years due to the destruction of their earlier colonies. About 50 nestlings were banded, and the 9 recoveries obtained so far indicate a southwestern as well as a southeastern migration route. —Louise de K. Lawrence.

52. The Bird-Life of the Sasér-Bird-Sanctuary of Hódmezörásárhely, according to Observations from 1948 till 1954. I. Sterbetz. 1956-57. *Aquila*, **63-64**; 177-193. (In Hungarian with English summary.) Up to a century ago the Great Hungarian Lowland was one of the "finest bird biotopes of Central Europe" largely due to flooding by the Danube and other rivers. Drainage has now almost "put an end to the world of the fens," but a 68-hectare island, made by an oxbow of the river Tisza, has been preserved as a sanctuary and in its marshes and woods many egrets, herons, some hawks and other birds breed. New rice fields were started in the vicinity in 1944 and these afford good feeding grounds for many marsh and wading birds.—M. M. Nice.

53. Report on the waterfowl census in the Winters of 1954-55 to 1956-57 and on the international waterfowl census from 1952-53 to 1956-57. (Bericht über die Wasservogelzählungen in den Wintern 1954/55 bis 1956/57 und über die internationalen Wasservogelzählungen von 1952/53 bis 1956/57.) Dieter Burckhardt. 1958. *Der Ornithologische Beobachter*, **55**: 1-30. This comprehensive report contains a mass of information obtained from 182 to 230 observers on the Swiss census and 22 to 88 on the international census. The former count is made during a 16-day period over the Christmas holidays and the latter on selected dates during the late fall, winter, and early spring. The Swiss census totaled 152,000, 160,000 and 162,000 for the 3 years reported with 69,000, 85,000 and 84,000 being reported from German Switzerland, the balance from West (French) Switzerland. Overall, three species, Mallard, Black-headed Gull, and Coot, comprise from 65-76 percent of the total. The Western census data differ principally in the larger number of Grebes reported, for reasons still requiring study.

The data from the international census provide information on seasonal status of each species. Some information on the variation in sex ratio is also available and is presented. The author also provides a short history of each census, reviews the objectives, and discusses possible errors and omissions. A good, thorough report.—R. O. Bender.

59. A few observations and determinations of the Ptarmigan. (Einige Beobachtungen und Feststellungen beim Alpenschneehuln *(Lagopus mutus helveticus Thienemann).)* D. Müller-Using. 1958. *Ornithologische Mitteilungen*, **10**: 46-50. In a brief review of the sparse literature on this species, the author points out several discrepancies and one error. The error is a weight of 400-480 g. reported by Von Burg and widely quoted by others. The actual weight is shown to average around 500 g. with sexual and seasonal variations, the male being heavier. Responding to a milder climate, the species has withdrawn northward several hundred kilometers in Scandinavia and to higher altitudes in the Alps.—R. O. Bender.

SYSTEMATICS
(See also numbers 47, 49, 50)

55. Hybridization in the Red-eyed Towhees of Mexico: the eastern plateau population. Charles G. Sibley and David A. West. 1958. *Condor*, **60**(2): 85-104. This is a continuation of Sibley's studies on the towhees. The hybridization between *Pipilo erythrophthalmus* and *P. ocai* is considered in the area between the states of Hidalgo and Oaxaca and eastward to the edge of the highlands. A "hybrid index" or summed score of six plumage areas in which two species differ is used. "From northeast of Mexico City to the mountains of southwestern Jalisco, is a clinal series of populations which gradually bridges the geographical and morphological gaps between nearly pure *erythrophthalmus* in Hidalgo (Pachuca) to nearly pure *ocai* in Jalisco." In the mountains the two species are often sympatric, but little hybridization occurs between Cofre de Perote and Zoquitlán (southern Puebla) and none to the east of Oaxaca City. It is evident that selection is operating on the hybrids in different degree in different areas. The author considers any selection against the hybrids to occur after the populations come in contact. It is possible that there are areas where the nonhybridizing populations were preadapted against hybridization. One further small point, the presence of rufous in the crown of *erythrophthalmus* might occasionally be the persistence of a juvenile character rather than evidence of crossing. I have handled one such yearling male in Massachusetts. The article gives a complete account of the dimensions and weights of the specimens studied. —C. H. Blake.

56. Classification and systematic position of the eiders. Philip S. Humphrey. 1958. *Condor*, **60**(2): 129-135. Do the eiders belong with most diving ducks in the tribe Mergini or in a separate tribe, Somateriini, next the Anatini? The tracheal bullas are enlarged to the left and without fenestrae. Except in *Polysticta* the bronchi are enlarged, the left one more than the right. Adults and young use predominantly plant foods during the breeding season. The half-opened wings play a part in underwater propulsion. Two genera, *Polysticta* and *Somateria*, are recognized and the eiders are placed in a separate tribe next the Anatini.—C. H. Blake.

57. A white-throated Golden-crowned Sparrow. Charles G. Sibley. 1956. *Condor*, **58**(4): 294-295. A *Zonotrichia atricapilla* with a white throat but otherwise giving no evidence of hybridization with *albicollis* is described. Sibley concludes there is a general genetic basis for white throat in the genus.—C. H. Blake.

58. Specific relationships in the genus *Elanus*. Kenneth C. Parkes. 1958. *Condor*, **60**(2): 139-140. On plumage characters *E. caeruleus*, nearly world wide with nine races, and *E. scriptus*, Australian, are admitted. The two species are sympatric only in Australia.—C. H. Blake.

FOOD

(See also numbers 20, 21, 28)

59. The Feeding Habits of Cormorants in Victoria. J. McNally. 1957. *Fauna Contribution* No. 6, Fisheries and Game Department, Melbourne, Victoria. pp. 1-36. The results of a 5-year study from 1949 to 1955 on the relation of cormorants, particularly *Phalacrocorax carbo*, to the inland, estuarine, and marine fisheries of Australia. The author collected and examined the contents of 2,043 stomachs of the 6 species of phalacrocracine birds occurring in Australia from various habitats, which showed these birds feed on fish and crustacea almost exclusively. He concludes that none of these birds "is a predator of any significance on the marine fisheries," and "in large internal waters cormorants exert a beneficial influence by controlling the numbers of introduced English Perch and Carp and native Yobbies" (a crustacean, *Cherax*, that destroys dams, levee walls, and irrigation banks). While he acknowledges that *P. carbo* "is detrimental to the trout fisheries on inland waters under certain conditions and local control of numbers is then necessary," he decries the bounty system forcefully, states that "no data so far produced would justify the expenditure of large sums of public money on the destruction of cormorants," and warns that "no attempt should be made at State-wide control until a complete investigation . . . has been made and all the facts become available."—O. L. Austin, Jr.

60. Destruction of seed infestations by titmice. (Über die Vernichtung einiger Samenschädlings durch Meisen). F. J. Turček. 1957. *Waldhygiene*, **2**(1): 1-3. In Czechoslovakia 15-20 percent (or more) of the seed crop of certain maples and ashes is destroyed by insects (especially tortricids). In October in the Polana Mts. 40-50 percent of seeds of sycamore maple *(Acer pseudoplatanus)* were infested. About 20 percent of seeds on the ground had been opened by titmice and the caterpillars were gone. The birds were: Coal Tit *(Parus ater)*, Marsh Tit *(P. palustris)*, and rarely Blue Tit *(P. coeruleus)*. However, Willow Tit *(P. atricapillus)* and Marsh Tit use the fatty seeds of goose-grass *(Galeopsis tetrahit)* almost exclusively from late August to early October as well as the similar seeds of *Salvia* spp. In December the seeds of seven species of ash *(Fraxinus)* showed an average infestation of 28 percent. The infested seeds were systematically opened by Blue Tits. About 44 percent of the fallen seeds had been opened. In 2 percent there were still caterpillars and only 16 percent of the seeds still had caterpillars when the titmice worked on them. The effective destruction is, then, about 7 percent. The Blue Tit also systematically destroys a scale insect *(Lecanium corni)* on plum trees, while the Long-tailed Tit *(Aegithalos caudatus)* attacks the scale only casually.—C. H. Blake.

61. Observations on the Feeding of the Oystercatcher in Captivity. R. E. Drinnan. 1958. *British Birds*, **51**(4): 139-149. Wild *Haemotopus ostralegus* were estimated to eat some 17.5 percent of their body weight per day; 2 birds in captivity, weighing about 445 grams each, kept up their weight on less food.—M. M. Nice.

62. Repeated attacks by a Sharp-shinned Hawk on a Pileated Woodpecker. Lawrence Kilham. 1958. *Condor*, **60**(2): 141-142. The hawk made seven attacks in 10 minutes without success. The woodpecker seemed to take proper evasive action at the right moments and remained in the vicinity showing no evident fear of the hawk.—C. H. Blake.

SONG

63. Songs of Warblers of Eastern North America. Recorded by Donald J. Borror and William W. H. Gunn. 1958. Federation of Ontario Naturalists, 187 Highbourne Road, Toronto, Ontario. 33 1/3 rpm., 12". $5.95 (U. S.) This record is comparable to the Cornell and Stillwell series in accuracy of reproduction and low surface noise. Devoted entirely to the wood warblers, it contains more than 400 songs from 170 individuals of 38 species in eastern North America and omits only the excessively rare Bachman's and problematical Sutton's. This compares with some 23 species previously available, taking all the Cornell and Stillwell releases together, and with the songs well scattered through the various disks (in addition to these 38, two western species—Audubon's and Lucy's—are included in the Stillwell record reviewed in *Bird-Banding*, **28:** 183; three Mexican species are included in a recent Cornell release—see review No. 64 in this issue).

The species are arranged in four groups: those with phrases sung slowly (less than 6 per second); those with songs trilled (6-30 notes per second); those with songs buzzy (more than 30 notes per second); and those with songs with varied phrases. This arrangement is probably the most durable one, when a large number of species are compared. It brings together many of the species for which the field observer desires a direct comparison, such as the Nashville and Tennessee Warblers, or Blue-winged and Golden-winged, or Magnolia and Hooded. It is less felicitous for some other pairs for which a direct comparison is helpful, such as Cape May and Bay-breasted Warblers, or the two waterthrushes. However, it would clearly be impossible to arrange all 38 species primarily for such comparisons.

For any serious student of the songs of these warblers, the new record is incomparable, even if he has all of the Cornell and Stillwell records. In addition to showing many more species, it includes a variety of songs of each species, along lines first stressed by the Stillwells but with more examples (up to 10 different individuals, or 10 songs of one individual). The state in which each individual was recorded is listed and also the month. Familiarity with these songs would be of major assistance to anyone going into territory new to him, particularly for species which are uncommon, or skulking in habit.—E. Alexander Bergstrom.

64. Mexican Bird Songs. Recording by L. Irby Davis, cover drawings by W. C. Dilger. 1958. Cornell University Records. 33 1/3 rpm., 12". $7.75. This vinylite record has the same high quality of sound and low surface noise as other recent Cornell releases. Of the 74 birds listed, only a handful occur in the United States, and most of these only near the Mexican border. The songs of the individual species follow an introduction, consisting of dawn choruses from four typical habitats. These bring to the armchair traveler the memorable experience of hearing for the first time a musical and distinctive chorus of entirely new birds. Most of us cannot accomplish this in the flesh very often, and our long familiarity with the dawn chorus at our homes may lead us to take it too much for granted.

No one going to Mexico for the first time to see birds should neglect to buy this record and listen to it closely. Few of those who have already visited Mexico at least once will have had an opportunity to become familiar with all these songs. While records of birds found in the U. S. have proved valuable to experienced observers going into a new area, the value of this Mexican record is enhanced by lack of any good field-guide descriptions for most of the songs. The only real field guide available for Mexico at present (*Birds of Mexico, A Guide for Field Identification*, E. R. Blake, 1953, The University of Chicago Press) does not refer to songs of many species at all, and descriptions of others are often in very general terms. As so many Mexican genera or families have no representatives in the U. S., observers going to Mexico for the first time have trouble in fitting songs into any familiar frame of reference.

Anyone using the record will be impressed by the perennial difficulties in agreeing on English names for the birds, typical of an area in which many visitors prefer to avoid relying on the scientific name entirely, and yet where English names are not indigenous. While it is impossible for a record to use English names that all students of Mexican birds would agree on, it is a pity that the names used don't follow any *one* of the three most widely used brief lists of names ((a) Blake, *op. cit.*; (b) *Distributional Checklist of the Birds of Mexico*, Part 1, 1950, Part 2,

1957, Cooper Ornithological Society; (c) *The Species of Middle American Birds*, Eugene Eisenmann, 1955, *Transactions of the Linnaean Society of N. Y.*, VII.). —E. Alexander Bergstrom.

65. An Evening in Sapsucker Woods. Produced by P. P. Kellogg and A. A. Allen, Laboratory of Ornithology and the Department of Conservation at Cornell University, from recordings made for the Cornell Library of Natural Sounds. 1958. Cornell University Records. 33 1/3 rpm., 10". $4.95. This record affords an excellent introduction to recorded voices, including 27 species of birds and 5 of amphibians typical of Sapsucker Woods, near Ithaca, N. Y., headquarters for the Laboratory of Ornithology. All 32 voices are introduced on one side of the record, and repeated on the other in different order without identification, as an identification test. Also, the album lists a number of species heard faintly in the background and not identified in the record, as a challenge to the advanced bird watcher. Sound reproduction is excellent and surface noise low.—E. Alexander Bergstrom.

66. Morning and evening song of robins in different latitudes. Robert C. Miller. 1958. *Condor*, **60**(2): 105-107. Uninterrupted singing begins earlier (as early as 0058) with increase of latitude and lasts longer (42 min. at lat. 38° to 89 min. at lat. 60°). Evening song ends earlier with increase of latitude and appears to vanish at some latitude north of 58°.—C. H. Blake.

BOOKS

67. Extinct and Vanishing Birds of the World. James C. Greenway, Jr. 1958. Special Publication No. 13. American Committee for International Wild Life Protection. New York, N. Y. $5.00. 518 pp. An exceedingly interesting book, packed with information. The author treats largely of "discrete populations" that "have disappeared during the 270 years since the last dodo is thought to have died." Lists are given not only of those species and subspecies known to be extinct, but of those probably extinct, and—a very important feature—of small populations many of which are in grave danger of extinction.

The "Geography of Extinction" (pp. 29-137) is a notable contribution. "As far as it known neither Africa nor South America has suffered losses in recent times"; Europe has lost the Great Auk and ostriches, and Asia one and perhaps 3 other species. Island fauna and North America have borne "the brunt of sudden and devastating incursion of modern Europeans." The shocking story of destruction is discussed under the West Indies, North America, the Hawaiian Islands, Pacific Islands, and Islands of the Indian Oceans. Overspecialization of the birds and ruthless use by human beings are two of the underlying factors making for extinction. Man's satellites, deliberately or accidentally released on islands, have wreaked havoc; goats, rabbits, pigs, cattle, deer have destroyed the habitats; black and brown rats, cats, dogs, pigs, foxes, mongooses, stoats, have devoured birds and eggs.

In North America the increase and westward spread of the human population and the decrease of the forests are traced step by step and a close correlation found with the extirpation of the Passenger Pigeon, Carolina Paroquet, and Ivory-billed Woodpecker. As to the Eskimo Curlew, when the "eager gunners" of 1870-1900 saw a field of 50 acres covered with these birds, it is probable "they had a considerable portion of the whole species before their eyes."

One cheering note: for many years the ferocity of some of the South Pacific natives protected their coasts from white men and their pests, hence the fauna and flora of these islands are less impoverished than those of most islands. Rennell Island, 90 miles west of San Cristobal, is "an extraordinary, an even unique island. . . . Of the 33 land and fresh-water forms known to nest on the island, 19 (57 percent) are to be found nowhere else. . . . The Australian Government has made great efforts to keep the island and its fauna inviolate." Here "the birds are as nearly in their natural state as any in the world."

The future for the birds on the South Atlantic Islands is gloomy. "The birds have disappeared from Tristan within 50 years. Men have moved in on them and literally devoured them" (cf. No. 48). This history is almost sure to be repeated on the other islands with the "growing population of human beings, without adequate food."

Three hundred pages are devoted to "Accounts of Extinct or Vanishing Forms"; these give synonomy, status, range, description, remarks and location of specimens; the numerous sketches by D. M. Reid-Henry are a helpful feature. Two histories differing from the usual pattern of persecution are of interest. The Guadalupe Caracara was purposely extirpated by goat-herders who believed these birds killed kids. Would that the Caracaras had killed them all! At present the island is infested with 40,000 to 50,000 hungry goats that have destroyed most of the forests on the island and thus have been one of the chief factors in extirpating 39 percent of the breeding bird fauna. In California Burrowing Owls and their broods have been "inadvertently" slaughtered by the poisoning and sealing of burrows of ground-nesting mammals by employees of the United States Government.

In the Foreword, Jean Delacour mentions a dozen threatened species that could be saved through protective measures; he urges research on the habits and nesting localities of a dozen more, and calls for adequate refuges for others. Some species can be saved by "propagation in captivity or at controlled liberty; such is the case of many species of game birds, waterfowl, cranes, pigeons and doves and parrots." With exploding human populations, increasing and indiscriminate use of deadly poisons, and penetration into more and more remote areas, the situation is ominous. "It is sad to realize that so many beautiful creatures have vanished forever or may very soon die out. It should be a lesson for mankind and remind us of our duty toward Nature. We play on earth a leading role, which should not be that of a villain.—M. M. Nice.

68. The Travels of William Bartram. Naturalist's Edition. Edited by Francis Harper. 1958. New Haven, Yale University Press. 723 pp. $8.50. For 40 years Francis Harper has consulted and utilized William Bartram's justly famous "Travels" (1791) in his own studies on the natural history of Georgia and neighboring states. In this volume he gives us a faithful rendition of the "Travels" with a Commentary that elucidates Bartram's route; a very full Annotated Index which translates Bartram's names of plants and animals into current nomenclature, as well as discussing a multitude of other items in the text; reproductions of 14 of Bartram's drawings; photographs of scenes visited by Bartram; a number of maps and other aids. Thanks to Dr. Harper's conscientious and zealous labors in the field and study we have here a true "Naturalist's Edition" which will be of great value and inspiration to present-day naturalists.

Although primarily a botanist, Bartram had a keen and sympathetic interest in all forms of animal life, as is constantly shown throughout his "Travels," and particularly in Chapter X of Part Two. Here he describes snakes, frogs, and "beasts"; discusses the subject of bird migration, and gives an annotated list of land birds from Pennsylvania south to Florida. Coues (1884) considered the "Travels" "the starting-point of a distinctly American school of ornithology."

What a picture Bartram gives of the wealth of wild life nearly 200 years ago—the "sublime forests," the "enamelled meadows," the "pellucid streams," the incredible abundance of animal life, particularly of alligators, fish, and birds. "The alligator when full grown is a very large and terrible creature, and of prodigious strength, activity and swiftness in the water." On one solitary canoe trip in Florida Bartram was in great danger from these animals, and owed his life to being awakened by "terrifying screams" of Barred Owls just in time to ward off an attack. Dr. Harper comments that "There is every reason to believe that Alligators, before they had become cowed by firearms, were given to just such attacks on human beings as our author describes."

Of his first camp on the St. John's Bartram writes of the beauty of the trees and shrubs. "Our repose however was incomplete, from the stings of mosquitoes, the roaring of crocodiles [alligators], and the continual noise and restlessness of sea fowl, thousands of them [having their roosting-places very near us, particularly loons of various species, herons, pelicans, Spanish curlews [immature White Ibises], etc., all promiscuously lodging together, and in such incredible numbers, that the trees were entirely covered."

He describes the magnificent great cypress trees with "the extensive flat horizontal top . . . where eagles have their secure nests, and cranes and storks their temporary resting places. . . . Paroquets are commonly seen hovering and fluttering on their tops: they delight to shell the balls, its seed being their

favorite food." Near the present settlement of Picoleta in St. John's County, Florida, he wrote:

"I was awakened in the morning early, by the cheering converse of the wild turkey-cock (Meleagris occidentalis) saluting each other, from the sun-brightened tops of the lofty Cupressus disticha and Magnolia grandiflora. They begin at early dawn, and continue till sunrise, from March to the last of April. The high forests ring with the noise, like the crowing of the domestic cock, of these social centinels, the watchword being caught and repeated, from one to another, for hundreds of miles around; insomuch that the whole country is, for an hour or more, in an universal shout. A little after sunrise, their crowing gradually ceases, they quit their high lodging places, and alight on the earth, where, expanding their silver bordered train, they strut and dance round about the coy female, while the deep forests seem to tremble with their shrill noise."

Once a hunter brought in a Sandhill Crane. "We had this fowl dressed for supper and it made excellent soup, nevertheless as long as I can get any other necessary food I shall prefer his seraphic music in the etherial skies, and my eyes and understanding gratified in observing their economy and social communities, in the expansive savannas of Florida."

Bartram was so moved by the scenes he saw that he prayed to the Creator that man "with his power and pre-eminence, here on earth" might "be endowed with a due sense of charity" so that we might "perform our duty towards those submitted to our service, and protection, and be merciful to them even as we hope for mercy." How miserably we have failed to exercise our vaunted intelligence and our terrifying power to cherish the life of this wonderful world! May this book inspire us to redoubled efforts to save a remnant of wild life before it is too late. M. M. Nice.

69. A Population Study of Penguins. L. E. Richdale. 1957. Oxford. University Press. New York. 2 photos. 195 pp. $6.75. A notable study on a sedentary, long-lived bird, the Yellow-eyed Penguin *(Megadyptes antipodes)*, on the Otago Peninsula, New Zealand, carried on for 18 seasons and involving 1,318 visits. As described in the appendix all birds were foot-marked, while adults and juveniles were also banded. The chief observations in this book concern 819 separate nestings of 203 males and 202 females that bred for at least 1 year. The author has also studied to a lesser extent 6 other species of penguins.

The Yellow-eyed Penguin pair tends to remain together, but divorce is more than a chance occurrence. One pair stayed together for 13 years. One male was unmated during his first 8 adult years, but bred during the next 3. Another male was unmated for 5 seasons, but in the next 10 had 4 mates and was unmated during 5 seasons; further he mated with the same female on 2 separate occasions 7 years apart. There is an excess of males among the breeding birds, hence no female was unmated once she acquired a mate. Both members of the pair share equally the labors of raising the young, but since males often get involuntary vacations from breeding while the females do not, the higher mortality of the latter may be partly due to the greater physiological wear and tear they suffer.

Measurements and weights of eggs are tabulated, as well as dates of laying. Females tended to lay consistently early, late, or about average, and daughters tended to resemble their mothers in this respect. This was true in one case in 3 generations, all birds laying from 0.1 to 1.0 day later than average, but a great-granddaughter was 5 days later than average in 2 layings. All penguins lay 2 eggs, except the Emperor *(Aptenodytes fosteri)* and the King *(A. patagonica)* which lay one. The Yellow-eyed's incubation period is some 43.5 days; first and second breeders averaged 44.2 days, and breeders over 5 years of age 42.9 days. Table 12 gives data on incubation periods in 15 species of penguins; these range from 33 days in the Adelie Penguin *(Pygosceles adéliae)* to 63 in the Emperor.

The chicks at hatching are helpless, covered with down, and with their eyes closed; at 4 weeks they are no longer brooded, but are still guarded. At about 45 days both parents start bringing food; if one is lost, the survivor cannot feed 2 chicks and one dies. The notion of the crêche system is examined and found wanting; in all studies with marked penguins of different species each parent normally feeds its own chicks and no others. Yellow-eyed chicks leave the shore at about 106 days of age. Table 24 gives the length of chick period in 10 species

of penguins; it varies from 17½ weeks in the Little Blue *(Eudyptila minor)* to 18 months in the King.

Of 411 fledgling Yellow-eyes that entered the sea, 170 were recovered—41 percent. There were 3 cases of brothers and sisters mating, and one of half-brother and half-sister, as well as 3 cases of second cousins. Much valuable information is given on the influence of age of breeding biology. In the chapter on "Survival and Mortality" we find that of 1,073 eggs 838 (78%) hatched and 638 (59%) were reared. Of 910 eggs laid from 1936-1950, 140 chicks survived to breed (15.4%). As to longevity "two males and three females at least 19 years old were still alive" at the end of the study. In a Yellow-eyed community of a reasonable size "the average age for breeding males will be between 7 and 8 years and for females one year younger." The final chapter deals exhaustively with the moulting season both in the Yellow-eyed and other penguins. The book contains 87 tables and its index covers subjects, authors, and species.

In this review I have given only a few samples of the abundance of material in this volume. Besides the remarkable study on the Yellow-eyed Penguin, all reliable data on other species of penguins are included, as well as much pertinent matter on other birds. The book would have been easier to read and its wealth of information more accessible had each chapter been provided with a good summary, and also if there had been a final "summary and conclusions." In this population study Dr. Richdale has again made a major contribution to ornithology.—M. M. Nice.

70. The Bird Watcher's Anthology. Roger Tory Peterson. 1957. Harcourt, Brace and Company, New York. 401 pp., ill. Price $7.50. This lively collection of 85 excerpts from the works of almost as many authors, each introduced by an explanatory foreword by the compiler, samples the field of popular writing on birds remarkably well. The selections run the gamut from the great classics—White, Audubon, Wilson, Darwin, Wallace, Bates, Burroughs—to modern works that have yet to be evaluated by the test of time. In choosing them the compiler used as his paramount criterion their interest to the ornithophile, and gave little if any consideration to their scientific importance or their literary merits. When reading them side-by-side, it is interesting to note how the writings of such acknowledged stylists as Hudson and Thoreau stand out above those of lesser merit. Nevertheless the result is a fine book for the bird-lover's bedside table or the bookcase nearest his favorite chair for evening browsing.

No two critics could possibly agree on the choices Peterson has made from the wealth of material now available in English. My own choices would have been different in a number of cases, and doubtless less appealing to the average ornithophile: I much prefer Beebe's earlier work, the essays in *Jungle Peace*, for instance, to his more recent writings; I would have taken excerpts from *The Fulmar* rather than Fisher's Tortugas sketch; and I'm sure Ernest Thompson Seton's description of his own "spark" from *Two Little Savages* was omitted only because the compiler couldn't edit it down to fit the available space.

My main regret (it is not a criticism) is that space limitations and his efforts to cover so wide a field forced Peterson to use far too short pieces from some of my favorite authors—Edward Wilson, Apsley Cherry-Garrard, and Henry Beston, for instance. But I am delighted to find these and many other old friends here, together with several writers I had never read—Deck, Boyd, Jeffries—and whose acquaintance I am indeed glad to have made. In proof thereof I have already searched out more of their work, and if his anthology encourages other ornithophiles to do likewise, I am sure nothing could please the compiler more. O. L. Austin, Jr.

71. The Arctic Year. Peter Freuchen and Finn Salomonsen. 1958. G. P. Putnam's Sons, New York. 438 pp., many line drawings. $5.95. This month-by-month account of life in the Arctic zone ranges over a wide variety of subjects, drawing upon the combined experience of two men who have devoted most of their lives to the Arctic. The late Peter Freuchen was one of the most active explorers in our times, and lived with the Eskimos through several winters. Dr. Finn Salomonsen of the Universitets Zoologiske Museum in Copenhagen is best known as author of the classic *Birds of Greenland.*

The result is the best single book on the Arctic I have seen. It can be read with pleasure by the general public, yet is specific enough to be useful to the specialist in any of the fields of natural history it discusses—birds, animals, plants, insects, marine life. Banding in Greenland has added materially to our knowledge of the migrations and other movements of Arctic birds. In addition to what Eskimos catch or shoot for food at different seasons, the reader learns a great deal about how they adapt their lives to a rigorous climate—for example, making sledge-runners of frozen mud sheathed in a thin layer of ice.—E. Alexander Bergstrom.

NOTES AND NEWS

The British Trust for Ornithology has reprinted, for the use of its members, "Banding With Mist Nets," by Seth H. Low *(Bird-Banding*, **28**: 115-128, July, 1957). Demand for copies of that issue has exhausted the extra supply which we printed for free distribution. However, any reader who would like a copy of the B.T.O. separate may have it without charge by writing to the editor of *Bird-Banding*.

In addition to the three standard sizes of mist nets stocked by the Northeastern Bird-Banding Association, we have a few experimental nets, like the shorebird nets (type C) but undyed silk, off-white in color. It is possible that this color may be effective on a white beach, or that it would be worthwhile to dye the net to match the color of other beaches. Details of any of these nets may be obtained from E. Alexander Bergstrom, 37 Old Brook Road, West Hartford 7, Conn.

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